

SCIENCE

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CONTENTS

| | |
|---|-----|
| <i>Doctorates conferred by American Universities</i> | 129 |
| <i>The Celebration of the Two-hundredth Anniversary of the Royal Society</i> | 139 |
| <i>Paul Caspar Freer</i> | 140 |
| <i>Scientific Notes and News</i> | 141 |
| <i>University and Educational News</i> | 143 |
| <i>Discussion and Correspondence:—</i> | |
| <i>Sex-limited Inheritance in Cats</i> : L. DONCASTER. "Terms used to denote the Abundance or Rarity of Birds": W. L. MCATEE, P. A. TAVERNER. "Florida Weather": J. R. WATSON | 144 |
| <i>Scientific Books:—</i> | |
| <i>Duchene on the Mechanics of the Aeroplane</i> : PROFESSOR A. F. ZAHM. <i>Cohen and Ruston on Smoke</i> : DR. R. C. BENNER. <i>Index to a Hand-list of the Genera and Species of Birds</i> : J. A. A. Whetham's <i>Heredity and Society</i> : PROFESSOR C. B. DAVENPORT | 148 |
| <i>The Inheritance of Skin Color</i> : PROFESSOR H. E. JORDAN | 151 |
| <i>Special Articles:—</i> | |
| <i>A Reversal of the Rowland Effect</i> : PROFESSOR FRANCIS E. NIPHER. <i>The Preparation of Unbroken Pollen Mother Cells and other Cells for Studies in Mitosis</i> : ALBERT MANN. <i>Results of Pure Culture Studies on Phyllosticta pirina Sacc.</i> : C. H. CRABILL .. | 153 |
| <i>The North Carolina Academy of Science</i> : DR. E. W. GUDGER | 157 |

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

DOCTORATES CONFERRED BY AMERICAN UNIVERSITIES

IN the first five of the fifteen years during which records of the doctorates of philosophy conferred by our universities have been annually printed in SCIENCE, there was no increase in the number, the average being 233. In the course of the past ten years the number has about doubled, amounting this year to 492. The twenty-one German universities gave two years ago 1,703 doctorates of philosophy (of which 32 were to Americans), so we still fall far behind that country in the number of men adequately prepared for advanced teaching and research. As the population of the United States is half again as large as that of Germany, we must increase six-fold the number of doctorates conferred before we can reach the present level of that country.

The seven universities given at the beginning of the table conferred three fifths of all the degrees, but the other universities have gained somewhat, as for the first ten years covered by these statistics they conferred only one quarter of the degrees. The universities which have hitherto done less research work, and especially the state universities, are gaining somewhat on the older universities, with the exception of Columbia. This university has made a remarkable advance in the past two years, conferring this year 81 and last year 75 doctorates, thus drawing ahead of Chicago in the total number of degrees conferred in the past fifteen years. Yale and the Johns Hopkins remain about stationary in the number of degrees they confer, while Cornell, Pennsylvania and Harvard have

TABLE I
Doctorates Conferred

| | Average of 10 Years, 1898-1907 | 1908 | 1909 | 1910 | 1911 | 1912 | Total for 15 Years, 1898-1912 |
|----------------------------|--------------------------------------|------|------|------|------|------|-------------------------------------|
| Columbia..... | 32.2 | 55 | 59 | 44 | 75 | 81 | 636 |
| Chicago..... | 35.6 | 54 | 38 | 42 | 55 | 57 | 602 |
| Harvard..... | 33.8 | 42 | 38 | 35 | 42 | 41 | 536 |
| Yale..... | 31.8 | 32 | 44 | 27 | 31 | 31 | 483 |
| Johns Hopkins..... | 30.5 | 28 | 27 | 23 | 28 | 32 | 443 |
| Pennsylvania..... | 22.5 | 32 | 29 | 26 | 29 | 34 | 375 |
| Cornell..... | 18.1 | 22 | 34 | 35 | 34 | 33 | 339 |
| Wisconsin..... | 8.6 | 17 | 16 | 18 | 15 | 27 | 179 |
| Clark..... | 8.7 | 11 | 9 | 14 | 16 | 6 | 143 |
| New York..... | 6.7 | 15 | 13 | 11 | 17 | 10 | 133 |
| Michigan..... | 6.9 | 4 | 13 | 7 | 6 | 11 | 110 |
| Boston..... | 4.4 | 11 | 13 | 6 | 13 | 8 | 95 |
| California..... | 3.3 | 4 | 10 | 6 | 6 | 15 | 74 |
| Princeton..... | 2.6 | 6 | 4 | 8 | 9 | 12 | 65 |
| Illinois..... | .5 | 5 | 4 | 12 | 11 | 20 | 57 |
| Minnesota..... | 2.4 | 3 | 5 | 1 | 2 | 12 | 47 |
| Byrn Mawr..... | 2.1 | 4 | 2 | 5 | 5 | 9 | 46 |
| George Washington | 2.8 | 3 | 4 | 4 | 5 | 2 | 46 |
| Virginia..... | 2.8 | 4 | 1 | 4 | 2 | 4 | 43 |
| Brown..... | 2.3 | 2 | 5 | 1 | 4 | 6 | 41 |
| Catholic..... | 2.0 | 1 | 3 | 3 | 5 | 5 | 37 |
| Stanford..... | 1.4 | 2 | 3 | 5 | 4 | 4 | 32 |
| Nebraska..... | 2.0 | 2 | 2 | 1 | 0 | 3 | 28 |
| Iowa..... | 1.1 | 2 | 0 | 4 | 3 | 7 | 27 |
| Massachusetts Inst. | .3 | 3 | 0 | 3 | 2 | 6 | 17 |
| Cincinnati..... | .3 | 0 | 2 | 2 | 5 | 3 | 15 |
| Ohio..... | .4 | 0 | 2 | 0 | 2 | 5 | 13 |
| Indiana..... | .0 | 3 | 3 | 0 | 2 | 4 | 12 |
| Missouri..... | .4 | 3 | 0 | 2 | 2 | 1 | 12 |
| Vanderbilt..... | .6 | 1 | 1 | 2 | 0 | 1 | 11 |
| Washington..... | .7 | 1 | 0 | 0 | 2 | 1 | 11 |
| Georgetown..... | 1.0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Pittsburgh..... | .1 | 4 | 0 | 2 | 1 | 1 | 9 |
| Kansas..... | .3 | 0 | 0 | 3 | 1 | 0 | 7 |
| Syracuse..... | .2 | 0 | 2 | 1 | 2 | 0 | 7 |
| Colorado..... | .5 | 0 | 1 | 0 | 0 | 0 | 6 |
| North Carolina..... | .5 | 0 | 1 | 0 | 0 | 0 | 6 |
| Northwestern..... | .4 | 0 | 1 | 0 | 1 | 0 | 6 |
| Tufts..... | .5 | 0 | 0 | 1 | 0 | 0 | 6 |
| Washington and Lee..... | .4 | 1 | 0 | 0 | 0 | 0 | 5 |
| Lafayette..... | .3 | 0 | 0 | 0 | 0 | 0 | 3 |
| Dartmouth..... | .1 | 1 | 0 | 0 | 0 | 0 | 2 |
| Lehigh..... | .2 | 0 | 0 | 0 | 0 | 0 | 2 |
| Tulane..... | .1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total..... | 272.4 | 378 | 389 | 358 | 437 | 492 | 4,778 |

increased their numbers and in this order. Wisconsin conferred this year 27 degrees, Illinois 20, California 15, Minnesota 12 and Iowa 7, this being in each case a large advance over the numbers conferred in any previous year. Princeton with 12 degrees and Bryn Mawr with 9 also demonstrate a decided growth in graduate work.

TABLE II
Doctorates Conferred in the Sciences

| | Average of 10 Years, 1898-1907 | 1908 | 1909 | 1910 | 1911 | 1912 | Total for 15 Years, 1898-1912 | Per Cent. |
|-----------------------------|--------------------------------------|------|------|------|------|------|-------------------------------------|-----------|
| Chicago..... | 16.4 | 37 | 20 | 24 | 35 | 37 | 317 | 53 |
| Johns Hopkins..... | 16.8 | 17 | 20 | 15 | 19 | 23 | 262 | 59 |
| Columbia..... | 13.4 | 21 | 23 | 11 | 29 | 36 | 254 | 40 |
| Cornell..... | 10.4 | 15 | 24 | 27 | 27 | 28 | 225 | 66 |
| Yale..... | 12.4 | 16 | 27 | 12 | 15 | 21 | 215 | 45 |
| Harvard..... | 14.1 | 13 | 14 | 10 | 20 | 15 | 213 | 40 |
| Pennsylvania..... | 9.0 | 18 | 13 | 12 | 10 | 9 | 152 | 41 |
| Clark..... | 7.7 | 11 | 8 | 14 | 16 | 6 | 132 | 92 |
| Wisconsin..... | 2.8 | 6 | 4 | 13 | 13 | 14 | 78 | 44 |
| California..... | 2.4 | 2 | 6 | 4 | 5 | 12 | 53 | 72 |
| Michigan..... | 2.8 | 1 | 5 | 1 | 3 | 8 | 46 | 42 |
| Illinois..... | .3 | 0 | 2 | 9 | 6 | 15 | 35 | 61 |
| Princeton..... | 1.1 | 3 | 3 | 2 | 5 | 7 | 31 | 48 |
| George Washing- ton..... | 1.7 | 2 | 2 | 3 | 4 | 2 | 30 | 65 |
| Brown..... | 1.2 | 2 | 2 | 1 | 3 | 4 | 24 | 59 |
| Stanford..... | 1.1 | 2 | 2 | 1 | 4 | 3 | 23 | 72 |
| Bryn Mawr..... | 1.0 | 1 | 0 | 2 | 1 | 3 | 17 | 37 |
| Massachusetts Inst..... | .3 | 3 | 0 | 3 | 2 | 6 | 17 | 100 |
| Nebraska..... | 1.3 | 1 | 2 | 1 | 0 | 0 | 17 | 61 |
| Virginia..... | 1.1 | 2 | 0 | 1 | 1 | 2 | 17 | 40 |
| Minnesota..... | .7 | 1 | 2 | 1 | 2 | 2 | 15 | 32 |
| New York..... | .6 | 1 | 3 | 2 | 1 | 2 | 15 | 11 |
| Iowa..... | .7 | 0 | 0 | 2 | 1 | 3 | 13 | 48 |
| Ohio..... | .4 | 0 | 2 | 0 | 2 | 5 | 13 | 100 |
| Indiana..... | .0 | 3 | 3 | 0 | 2 | 4 | 12 | 100 |
| Washington..... | .7 | 1 | 0 | 0 | 2 | 1 | 11 | 100 |
| Catholic..... | .5 | - | 2 | 0 | 1 | 1 | 9 | 24 |
| Missouri..... | .3 | 2 | 0 | 2 | 2 | 0 | 9 | 75 |
| Cincinnati..... | .1 | 0 | 1 | 1 | 4 | 1 | 8 | 53 |
| Kansas..... | .3 | 0 | 0 | 3 | 1 | 0 | 7 | 100 |
| Vanderbilt..... | .3 | 1 | 1 | 0 | 0 | 1 | 6 | 55 |
| Tufts..... | .5 | 0 | 0 | 0 | 0 | 0 | 5 | 83 |
| North Carolina..... | .3 | 0 | 1 | 0 | 0 | 0 | 4 | 67 |
| Northwestern..... | .2 | 0 | 1 | 0 | 1 | 0 | 4 | 67 |
| Washington and Lee..... | .3 | 1 | 0 | 0 | 0 | 0 | 4 | 80 |
| Boston..... | .1 | 0 | 1 | 0 | 0 | 1 | 3 | 3 |
| Pittsburgh..... | .0 | 0 | 0 | 1 | 1 | 1 | 3 | 33 |
| Syracuse..... | .1 | 0 | 0 | 1 | 1 | 0 | 3 | 43 |
| Colorado..... | .2 | 0 | 0 | 0 | 0 | 0 | 2 | 33 |
| Dartmouth..... | .1 | 1 | 0 | 0 | 0 | 0 | 2 | 100 |
| Lehigh..... | .2 | 0 | 0 | 0 | 0 | 0 | 2 | 100 |
| Georgetown..... | .1 | 0 | 0 | 0 | 0 | 0 | 1 | 10 |
| Lafayette..... | .1 | 0 | 0 | 0 | 0 | 0 | 1 | 33 |
| Total..... | 124.1 | 184 | 194 | 179 | 239 | 273 | 2,310 | 48 |

It is a fact of interest to readers of this journal that the number of degrees conferred in the natural and exact sciences increases more rapidly than in other subjects. During the ten years from 1898 to 1907 there were conferred an average of 124

degrees in the sciences as compared with 148 in other departments. In the following three years the numbers were almost exactly the same, whereas in the past two years the sciences have drawn ahead, being responsible this year for 273 degrees, as compared with 219 in other subjects. This advance is too large and too long continued to be attributable to a chance variation; it appears that the sciences are gaining ground in our universities. In Germany more degrees are conferred in the humanities than in the sciences, and the large number of degrees conferred there in the languages is striking. In this country there were this year only 17 degrees in Latin and 5 in Greek. Among the sciences, as always, chemistry leads and by a larger margin than ever before. This degree is in many cases awarded to men who propose to undertake industrial work; while this is doubtless quite as important as teaching, the degree has a somewhat different significance, so that it might indeed be advisable to award a doctorate of engineering rather than the doctorate of philosophy. Physics follows chemistry in the total number of degrees conferred, and is in turn followed by zoology, though there were this year more degrees awarded in botany, mathematics, geology and psychology than in zoology. Agriculture and bacteriology, as well as botany, show decided gains; there are also gains in physiology and anatomy.

The institutions which this year conferred two or more degrees in a science are: in *chemistry*, Columbia, 11; Johns Hopkins and Yale, 9 each; Chicago and Wisconsin, 8 each; Illinois, 6; Cornell, 5; Harvard and Ohio, 4 each; Massachusetts Institute, 3; Michigan and Princeton, 2 each; in *physics*, Cornell and Princeton, 4 each; Chicago, Illinois, Michigan, Pennsylvania and Yale, 3 each; Columbia, Johns Hopkins and Wisconsin, 2 each; in *zoology*,

TABLE III
Doctorates Distributed According to Subjects

| | Average of 10 Years, 1898-1907 | 1908 | 1909 | 1910 | 1911 | 1912 | Total for 15 Years, 1898-1912 |
|-------------------|--------------------------------------|------|------|------|------|------|-------------------------------------|
| Chemistry..... | 32.3 | 54 | 43 | 48 | 68 | 78 | 614 |
| Physics..... | 15.5 | 22 | 25 | 25 | 33 | 30 | 290 |
| Zoology..... | 15.2 | 25 | 18 | 24 | 25 | 20 | 264 |
| Psychology..... | 13.5 | 23 | 21 | 20 | 23 | 29 | 251 |
| Mathematics..... | 12.1 | 23 | 14 | 23 | 25 | 22 | 228 |
| Botany..... | 12.6 | 11 | 16 | 10 | 20 | 30 | 213 |
| Geology..... | 7.1 | 5 | 13 | 10 | 15 | 22 | 136 |
| Physiology..... | 4.1 | 7 | 13 | 4 | 2 | 12 | 79 |
| Astronomy..... | 3.4 | 1 | 7 | 3 | 4 | 2 | 51 |
| Agriculture..... | 1.0 | 2 | 7 | 4 | 11 | 11 | 45 |
| Bacteriology..... | 1.4 | 1 | 5 | 1 | 4 | 6 | 31 |
| Anthropology..... | 1.0 | 4 | 4 | 2 | 2 | 0 | 22 |
| Paleontology..... | 1.6 | 1 | 0 | 2 | 0 | 1 | 20 |
| Anatomy..... | .9 | 2 | 0 | 1 | 1 | 6 | 19 |
| Pathology..... | .5 | 2 | 3 | 1 | 1 | 2 | 14 |
| Engineering..... | .8 | 0 | 0 | 1 | 2 | 2 | 13 |
| Mineralogy..... | .6 | 0 | 3 | 0 | 1 | 0 | 10 |
| Metallurgy..... | .3 | 0 | 1 | 0 | 1 | 0 | 5 |
| Geography..... | .1 | 1 | 1 | 0 | 1 | 0 | 4 |
| Meteorology..... | .1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total..... | 124.1 | 184 | 194 | 179 | 239 | 273 | 2,310 |

| | 1908 | 1909 | 1910 | 1911 | 1912 | Total for 5 Years |
|--|------|------|------|------|------|----------------------|
| English..... | 30 | 27 | 31 | 33 | 34 | 155 |
| History..... | 32 | 22 | 25 | 26 | 23 | 128 |
| Economics..... | 17 | 42 | 7 | 16 | 26 | 108 |
| Philosophy..... | 25 | 14 | 19 | 26 | 15 | 99 |
| Education..... | 6 | 9 | 13 | 23 | 22 | 73 |
| Latin..... | 12 | 12 | 15 | 11 | 17 | 67 |
| German..... | 14 | 14 | 16 | 7 | 15 | 66 |
| Romance..... | 12 | 16 | 6 | 12 | 15 | 61 |
| Sociology..... | 6 | 6 | 14 | 18 | 13 | 57 |
| Oriental..... | 9 | 15 | 11 | 1 | 10 | 46 |
| Greek..... | 13 | 11 | 5 | 7 | 5 | 41 |
| Political Science..... | 9 | 4 | 9 | 6 | 10 | 38 |
| Theology..... | 7 | 2 | 1 | 7 | 7 | 24 |
| Philology and Comparative Literature..... | 0 | 1 | 5 | 1 | 2 | 9 |
| Law..... | 1 | 0 | 1 | 2 | 1 | 5 |
| Classical Archeology..... | 0 | 0 | 0 | 1 | 3 | 4 |
| Music..... | 1 | 0 | 1 | 1 | 0 | 3 |
| Fine Arts..... | 0 | 0 | 0 | 0 | 1 | 1 |
| Total..... | 194 | 195 | 179 | 198 | 219 | 985 |

Harvard, 5; Cornell, 3; California and Chicago, 2 each; in *psychology*, Columbia, 8; Clark, 6; Pennsylvania, 4; Cornell, 3; Chicago and Johns Hopkins, 2 each; in *mathematics*, Chicago 7; Columbia, 4; Cali-

fornia, Johns Hopkins and Yale, 2 each; in *botany*, Chicago, 8; Cornell, 4; Columbia, 3; California, Indiana, Iowa and Michigan, 2 each; in *geology*, Johns Hopkins, 5; Yale, 4; Massachusetts Institute, 3; Bryn Mawr and Columbia, 2 each; in *physiology*, California, 4; Columbia, 3; Chicago, 2; in *agriculture*, Cornell, 6; Illinois, 3; in *bacteriology*, Brown, 2; in *pathology*, Chicago, 2.

The names of those on whom the degree was conferred in the natural and exact sciences, with the subjects of their theses, are as follows:

UNIVERSITY OF CHICAGO

Warder Clyde Allee: "The Effect of Dissolved Gases on the Behavior of Isopods."

Harriett May Allyn: "A Contribution to the Analysis of Fertilization in *Chaetopterus*."

Harold DeForest Arnold: "Limitations Imposed by Slip and Inertia Terms upon Stokes's Law for the Motion of Spheres through Liquids."

Melvin Amos Brannon: "The Action of Salton Sea Water on Plant Tissues."

Clyde Brooks: "The Effect of Lesions of the Dorsal Nerve on the Reflex Excitability of the Spinal Cord."

Edward Wilson Chittenden: "Infinite Developments and the Composition Property ($K_{12}B_1$)_s in General Analysis."

Grace Lucretia Clapp: "The Life History of *Aneura pinguis*."

Harry John Corper: "Correlation of Chemical and Histological Changes in Necrosis and Autolysis."

Edmund Vincent Cowdry: "The Relations of Mitochondria and other Cytoplasmic Constituents in Spinal Ganglion Cells of the Pigeon."

Lloyd Lyne Dynes: "The Highest Common Factor of a System of Polynomials with an Application to Implicit Functions."

Sophia Hennion Eckerson: "A Physiological and Chemical Study of After-ripening."

Charles Albert Fischer: "Some Contributions to the Theory of Functions of Lines."

Laura Campbell Gano: "The Physiographic Ecology of Northern Florida."

Stella Mary Hague: "A Morphological Study of *Diospyros virginiana*."

Ansel Francis Hemenway: "The Phloem of Dicotyledons."

Ernest Edward Irons: "Studies on Immunity."

Fred Conrad Koch: "The Nature of the Iodine Complex in Thyreo-globulin."

Oliver Justin Lee: "On the Conditions for Reversal of the Calcium Lines."

Harvey Brace Lemon: "The Influence of Temperature upon the Intensities of the Lines of the Hydrogen Spectrum."

Theodore Lindquist: "Mathematics for Freshmen Students of Engineering."

Arno Benedict Luckhardt: "The Relation of the Spleen to the Fixation of Antigens and the Production of Immune Bodies."

Eugene Franklin McCampbell: "The Toxic and Antigenic Properties of *Bacterium welchii*."

Howard Wilson Moody: "A Determination of the Ratio of the Specific Heats and the Specific Heat at Constant Pressure of Air and Carbon Dioxide."

John Foote Norton: "Simultaneous Reactions in Amide Formation."

Paul David Potter: "The Hydrates of Arsenic Pentoxide."

Carl Leo Stahr Rahn: "A Critical and Constructive Study of the Psychology of Thinking."

Ralph Eugene Root: "Iterated Limits in General Analysis."

Lester Whyland Sharp: "Spermatogenesis in Equisetum."

Anna Morse Starr: "Comparative Anatomy of Dune Plants."

Charles Thompson Sullivan: "Properties of Surfaces whose Asymptotic Lines belong to Linear Complexes."

Arthur Carleton Trowbridge: "The Geology of the Owens Valley California Region with special Reference to the Terrestrial Deposits."

Harlan Leo Trumbull: "The Molecular Rearrangement of Acid Chloramides and the Ionization of their Salts."

Charles Herman Viol: "Studies in Radioactivity."

Leroy Samuel Weatherby: "The 'Salt Effects' of the Nitrates and Sulphonates in the Catalysis of Imido Esters."

Franklin Lorenzo West: "The Physical and Chemical Properties of Organic Amalgams."

Russell Morse Wilder: "The Etiology of Typhus Fever."

Albert Harris Wilson: "The Canonical Types of Nets of Quadratic Forms in the Galvis Field of Order p^n ."

COLUMBIA UNIVERSITY

David Alperin: "Contribution to the Knowledge of Nucleoprotein Metabolism with special reference to Uricolysis and to the Properties of Uricase."

Tsuru Arai: "Mental Fatigue."

Charles Homer Bean: "The Curve of Forgetting."

Louis Edward Bisch: "Biochemical Studies of Protagon and Mucoid."

Jacob J. Bronfenbrenner: "A Biochemical Study of the Phenomenon known as Complement-splitting."

Arthur Jerome Culler: "Interference and Adaptability."

Bernard Ogilvie Dodge: "Methods of Culture and the Morphology of the Archicarp in certain Species of the Ascobolaceae."

Harry Linn Fisher: "The Preparation and Properties of 5-Amino-6-Quinoline-Carboxylic Acid, and some Compounds derived therefrom."

Alexander Oscar Gettler: "The Balance of Acid-forming and Base-forming Elements in Foods, and its Relation to Ammonia Metabolism."

Alfred Norton Goldsmith: "On the Spectroscopic Examination of Positive Rays isolated by Transmission through thin Partitions."

Marston Lovell Hamlin: "I. The Preparation of two Derivatives of Glucosamine. II. Spigeline, an Alkaloid of *Spigelia marilandica*. III. Derivatives of 4-Hydroxy-5-Nitro-Quinazoline."

Raleigh Frederick Hare: "A Study of the Chemistry of the Carbohydrates of the Prickly Pear and its Fruits."

John Diederich Haseman: "Some Factors of Geographical Distribution in South America."

Milo Burdette Hillegas: "A Scale for the Measurement of Quality in English Composition by Young People."

Jesse Earl Hyde: "The Waverly Formations of Central and Southern Ohio."

Max Kahn: "Biochemical Studies of Sulfocyanates."

John Leonard Kantor: "A Biochemical Test for Free Acid."

Joseph Lipke: "Natural Families of Curves in a General Curved Space of n Dimensions."

Henry Howard Marvin: "The Selective Transmission and the Dispersion of the Liquid Chlorides."

Chester Arthur Mathewson: "A Study of some of the more Important Biochemical Tests."

Julia Eleanor Moody: "Observations on the

Life-history of two Rare Ciliates—*Spathidium spathula* and *Actinobolus radians*."

Fayette T. Owen: "Part I. Molten Hydrated Salts as Solvents for Freezing Point Method. Part II. The Weight of the Falling Drop and the Laws of Tate."

Albert Theodore Poffenberger, Jr.: "Reaction Time to Retinal Stimulation; with reference to the Speed of Conduction through Nerve Centers."

David Edgar Rice: "Visual Acuity with Lights of Different Colors and Intensities."

Winifred Josephine Robinson: "A Taxonomic Study of the Pteridophyta of the Hawaiian Islands."

Emily Cromwell Seaman: "Biochemical Studies of the Effects of Beryllium Sulfate."

Lewis Parker Siceloff: "Simple Groups from Order 2001 to order 3640."

Benjamin Roy Simpson: "Correlation of Mental Abilities."

Bertram Garner Smith: "The Embryology of *Cryptobranchus allegheniensis*."

William Mackey Smith: "Simply Infinite Systems of Plane Curves. A Study of Isogonals, Equitangentials and other Families of Trajectories."

Charles Arthur Stewart: "The Geology and Ore-deposits of the Silverbell Mining District, Arizona."

Frederick Tilney: "Contribution to the Study of the Hypophysis Cerebri, with special reference to its Comparative Histology."

John Welhoff Todd: "Reaction to Multiple Stimuli."

Edward Everett Whitford: "The Pell Equation."

Harold Edward Woodward: "A Study of Surface Tension of Blood Serum by the Drop Weight Method."

Frederick William Zons: "A new Method, Volumetric, for the Determination of Thorium in the Presence of other Rare Earths and its Application to the Analysis of Monozite Sand."

CORNELL UNIVERSITY

Herman Camp Allen: "The Reduction of Nitrobenzene by Means of Ferrous Hydroxide."

Ross Peter Anderson: "Researches on Tellurium."

Mortier Franklin Barrus: "The Bean Anthracnose."

Henry Louis Brakel: "The Effect of Vibration on the Resistance of Metals."

Stanley Eugene Brasefield: "A Study of certain Force Fields."

Harry Oliver Buckman: "Optimum and Excessive Soil Moisture in its Effect upon the Soil and the Crop."

Lewis Josephus Cross: "A Study of the Relation of the Chemical Composition of Hens' Eggs to the Vitality of the Young Chick."

Lucy May Day: "The Effect of Illumination on Peripheral Vision."

Austin Southwick Edwards: "An Experimental Study of Suggestion."

Robert James Evans: "Studies in the Variation of *Stellaria media* as induced by Temperature Exposures."

Earl Frederick Farnau: "Luminescence."

Alexander Hardie Forman: "The Effect of Magnetization on the Opacity of Iron to Röntgen Rays."

Sidney Longman Galpin: "Studies of Flint Clays and their Associates."

Charles Cleveland Hedges: "Some Chemical Relations of Lime-sulphur Solutions, Lead Arsenate and Nicotine."

Emmet Francis Hitch: "Tetrachlorfluorescein and some of its Derivatives."

James Franklin Illingworth: "A Study of the Biology of the Apple Maggot (*Rhagoletis pomonella*) together with an Investigation of the Methods of Control."

Christian Nephi Jensen: "Fungous Flora of the Soil."

Clyde Everett Leighty: "Studies of Variation and Correlation of Oats (*Avena sativa*)."

Merris Mickey McCool: "The Antitoxic Action of certain Nutrient and Non-nutrient Mineral Bases with respect to Plants."

Anna Haven Morgan: "The Biology of Mayflies."

Frank Millett Morgan: "Involutorial Transformations."

Clyde Hadley Myers: "Variation, Correlation and Inheritance of Characters of Wheat and Peas grown on Soils of different Degrees of Fertility."

Irving Perrine: "The Claiborne Pelecypod Fauna of the Gulf Province."

Harry Westfall Redfield: "A Study of Hydrogen Sulphide Production by Bacteria and its Significance in the Sanitary Examination of Water."

George Jackman Sargent: "Electrolytic Chromium."

Alma de Vries Schaub: "On the Intensity of Images."

John Edwin Turlington: "The Effect on Plant Growth of Nutrients applied at different Periods."

Rhett Youmans Winters: "The Inheritance of Size of Capsules in Pepper Hybrids."

JOHNS HOPKINS UNIVERSITY

Raymond Binford: "The Germ-cells and the Process of Fertilization in the Crab *Menippe mercenaria*."

Thomas Ross Brown: "A Consideration of the Continued Fevers in the Tropics."

Joseph Chandler: "On the Reactions of Thiourazoles and Thiourazole Salts: I. A Study of the Reaction between Sodium 1-Phenyl-3-Thiourazole and Ethyl Iodide. II. A Study of 1, 4-Diphenyl-5-Thiourazole."

Burton William Clark: "The Trenton Limestone at Rathbone Brook, Herkimer County, New York—Its Stratigraphy, Fauna and Age."

Charles Wythe Cooke: "The Greenbrier Formation in Maryland. A Contribution to Mississippian Paleontology."

Paul Bell Davis: "Conductivity and Negative Viscosity Coefficients of certain Rubidium and Ammonium Salts in Glycerol, and in Mixtures of Glycerol with Water from 25° to 75°."

Felton Samuel Dengler: "I. The Detection and Determination of Minute Quantities of Glycerol. II. The Volumes of Weight-normal Cane Sugar Solutions at Different Temperatures."

Henry Otto Eysell: "I. The Detection of Mannite in Alkaline Solutions of Copper Sulphate. Combustion of Mannite by Alkaline Solutions of Potassium Permanganate in the Presence of Copper Sulphate. II. A Determination of the Volume of Weight-normal Solutions of Cane Sugar at 15°, 20°, 25° and 30°."

Julia Peachy Harrison: "On the Reversible Addition of Alcohols to Nitriles catalyzed by Sodium Ethylate."

Clarence Wilson Hewlett: "Analysis of Complex Sound Waves."

Oliver Baker Hopkins: "The Carboniferous Sphenophyllales, Equisetales and Lycopodiales of Maryland, including certain Forms from Pennsylvania and Ohio."

Samuel Francis Howard: "The Conductivity, Temperature Coefficients of Conductivity and Dissociation of certain Electrolytes in Aqueous Solution at 35°, 50° and 65°."

John Frederick Hunter: "A Study of the Precambrian Rocks of the Gunnison River."

Harry Miles Johnson: "Some Tests on the Reac-

tions of Dogs to Stimuli, under Conditions of Sensory Control."

Willis Edgar Maneval: "The Development of *Magnolia* and *Liriodendron*, including a Discussion of the Primitiveness of the Magnoliaceæ."

Charles Ferdinand Meyer: "On the Vibration of Telephone Diaphragms."

John William Nowell: "A Study of the Steric Hindrance Effect of various Substituent Groups in the Ortho Position to the Carboxyl; on the Reaction which takes Place when Parasulphaminobenzoic Acids are heated to 220°."

Alfred Springer, Jr.: "A Study of the Conductivity and Dissociation of certain Organic Acids in Aqueous Solution at different Temperatures."

Joshua Irving Tracey: "Researches on the Rational Quintic."

Lloyd Van Doren: "A Comparative Study of the Semi-permeable Membranes of Copper Ferrocyanide and Nickel Ferrocyanide."

George Ross Maurice Wells: "The Influence of Stimulus-duration on Reaction Time."

Richard Claggett Williams: "The Shenandoah Limestones of the Hagerstown Quadrangle."

Roy Martin Winger: "On Self-projective Rational Curves of the Fourth and Fifth Order."

YALE UNIVERSITY

William Raymond Barss: "Ionization by Collision in Gases and Vapors."

Philip Lee Blumenthal: "The Separation and Estimation of Chlorine and Bromine in Halogen Salts by the Differential Action of Oxidizers."

Charles Andrew Brautlecht: "Synthesis of Thio-tyrosine."

Gerald Burnham: "Sulphur Combinations in Proteins-thioproteptides."

Amy Louise Daniels: "Fat-transport and Metabolism, Studied with the Aid of Fat-soluble Dyes."

Archibald Lamont Daniels, Jr.: "On the Librations of Bodies whose Periods are One Third that of the Disturbing Body."

Charles Raymond Downs: "Water-gas Tar: its Composition and Commercial Possibilities."

Charles Wales Drysdale: "The Geology of the Franklin Mining District, British Columbia."

Marion Graham Elkins: "The Maturation Phases in *Smilax herbacea*."

Herbert Hartley Guest: "Thiohydantoins and their Biochemical Interest."

Frank Loyal Haigh: "On certain Physical Properties of the Alkali Nitrates, Chlorides and Sulphates."

Charles Hoffman: "A New Method for Synthesizing Alpha-amino Acids; Halogen Derivatives of Tyrosine."

Davenport Hooker: "The Development and Function of Voluntary and Cardiac Muscles in Embryos without Nerves."

Robert Curtis Lewis: "The Rate of Elimination of Nitrogen as influenced by Diet Factors."

Alexander Graham McGougan: "The Emission of Electrons by Metals under the Influence of Alpha Rays."

John Johnston O'Neill: "Geology and Petrography of the Beloeil and Rougemont Mountains, Quebec."

Samuel James Plimpton: "On the Recombination of Ions produced by Röntgen Rays."

William Henry Twenhofel: "Geology, Stratigraphy and Physiography of Anticosti Island."

Harley Richard Willard: "On a Family of Oscillating Orbits of Short Period (with a chart)."

Merton Yarwood Williams: "Geology of the Arisaig-Antigonish District, Nova Scotia."

Morley Evans Wilson: "Preliminary Memoir on the Abitibi District, Pontiac County, Quebec."

HARVARD UNIVERSITY

Roger Adams: "I. A Study of the Solubilities in Aqueous Alkalis of various Hydrazones of certain Aromatic Ortho-hydroxyaldehydes and Ketones. II. Nonanes. III. A New Bottling Apparatus."

John Detlefsen: "A Genetic Study of Color and Coat Characters, and Growth and Size in a Cavy Species Cross."

Arthur Johnson Eames: "The Morphology of *Agathis australis* (Lamb.) Steud."

Gustavus John Esselen, Jr.: "Studies on Benzhydrols. I. The Resolution of p-Aminobenzhydrol into its Optical Isomers. II. The Splitting of Benzhydrols by the Action of Bromine."

Augustus Henry Fiske: "I. On certain Nitro Derivatives of Vicinal Tribrombenzol. II. Decomposition of Tetrabromorthoquinone. III. Hydrates of Sodium Carbonate and their Temperatures of Transition."

Fred Ford Flanders: "The Determination and Metabolism of Benzoic Acid and Hippuric Acid."

Tomlinson Fort: "Problems connected with Linear Difference Equations of the Second Order with special Reference to Equations with Periodic Coefficients."

Alfred Otto Gross: "The Reactions of Arthropods to Monochromatic Lights of Equal Intensities."

Franklin Paradise Johnson: "The Development of the Mucosa of the Digestive Tube in the Human Embryo, with notes on the Effects of Distention of the Intestine upon the Shape of Villi and Glands."

Sidney Isaac Kornhauser: "A Comparative Study of the Chromosomes in the Spermatogenesis of *Enchenopa binotata* (Say) and *Enchenopa (Campylenchia Stål) curvata* (Fabr.)."

Edwin Carleton MacDowell: "Size Inheritance in Rabbits."

Samuel Copeland Palmer: "The Numerical Relations of the Histological Elements in the Vertebrate Retina."

Eugene Lyman Porter: "Conditions affecting the Liminal Electrical Stimulus of a Spinal Reflex."

John Edward Rouse: "The Mental Life of Domestic Pigeons: An Experimental Study of certain Emotional and Associative Processes."

George Defrees Shepardson: "The Equivalent Frequency of Telephone Circuits."

UNIVERSITY OF ILLINOIS

Samuel Herbert Anderson: "Ionization of Photo-electric Properties of Vapors of Alkali Metals."

Stuart Jeffery Bates: "The Iodine Coulometer and the Value of the Faraday."

Charley Francis Briscoe: "Tubercle Bacilli in Nature."

David William Cornelius: "The Study of the Velocity of Electrons in the Photo-electric Effect as a Function of the Wave-lengths of the Light."

William Wells Denton: "Projective Differential Geometry of Developable Surfaces."

James Everett Egan: "Observations on the Rare Earths. Yttrium Chloride and the Atomic Weight of Yttrium."

Hugh Byron Gordon: "A Differential Dynamic Method for the Accurate Determination of Relative Vapor-pressure Lowering."

Walter Edward Joseph: "A Study of Protein as a Factor in the Nutrition of Swine with special reference to the Distribution of the various Forms of Nitrogen in the Animal Body."

Jacob Garrett Kemp: "Conditions of Sensibility of Photo-electric Cells with Alkali Metals and Hydrogen."

Leonidas Rosser Littleton: "Molecular Rearrangements in the Camphor Series. Derivatives of Isocamphoric Acid; Isocaminolauronic Acid and its Decomposition Products."

Ellison Lloyd Ross: "Phosphorus Metabolism of Lambs."

Earle Kenneth Strachan: "The Equilibrium between Arsenious Acid and Iodine in Aqueous Solution."

Maurice Cole Tanquary: "Biological and Embryological Studies on Formicidæ."

Albert Lemuel Whiting: "A Biochemical Study of Nitrogen in certain Legumes."

Richard Hermon Williams: "A Study of Protein as a Factor in the Nutrition of Swine, with special reference to the Distribution of the Forms of Ash and Phosphorus in the Animal Body."

UNIVERSITY OF WISCONSIN

Martin Fuller Angell: "Thermal Conductivity of Metals at High Temperatures."

Freda Marie Bachman: "A Cytological Study of *Collema*."

Oscar Leonard Barneby: "Reactions of the Rare Earths in Non-aqueous Solvents."

Frederick William Cunningham: "A Study of Fume Settling."

Horace Grove Deming: "Some Compounds of Cellulose."

Melvin Edison Diemer: "A Study of Aurous Compounds."

Emil Oscar Ellingson: "On Abietic Acid and some of its Salts."

Robert Harvie: "Ontario Gabbros and Associated Ores."

Winfield Scott Hubbard: "Studies of the Tryptic Digestion of Silk."

Alfred Edward Koenig: "A Study of some of the Salts of Fatty Acids."

James Nelson Lawrence: "Efficiency of Gas Calorimeters."

George Vest McCauley: "The Distribution of Energy in the Spectra of Metals."

Warner Jackson Morse: "Comparative Studies of the Bacteria associated with the Blackleg Disease of Potatoes."

Carl Ferdinand Nelson: "Studies on Osmosis."

UNIVERSITY OF CALIFORNIA

Charles Barrows Bennett: "The Purines of Muscle."

Victor Birekner: "The Oxidations and Cleavages of Glucose: Yeast Glucose, a new Glucolytic Ferment."

Lyman Luther Daines: "The Comparative Development of the Cystocarps of *Antithamnion* and *Prionitis*."

Jay Clinton Elder: "The Relation of the Zona Pellucida to the Formation of the Fertilization Membrane in the Egg of the Sea Urchin (*Strongylocentrotus purpuratus*)."

Thomas Harper Goodspeed: "Quantitative Studies of Inheritance in *Nicotiana* Hybrids."

Myrtle Elizabeth Johnson: "The Control of Pigment Formation in Amphibian Larvæ."

Walter Pearson Kelley: "The Functions and Distribution of Manganese in Plants and Soils."

Charles Gustave Paul Kuschke: "The Abelian Equations of the 10th Degree, irreducible in a given Rational Domain."

Loye Holmes Miller: "Contributions to Avian Paleontology from the Pacific Coast Region of North America."

Edward Haslam Walters: "The Hydrolysis of Casein by Trypsin."

Baldwin Munger Woods: "A Discussion by Synthetic Methods of two Projective Pencils of Conics."

Reynold Young: "The Polarization of the Light in the Solar Corona."

UNIVERSITY OF PENNSYLVANIA

Newcomb Kinney Chaney: "The Electrolytic Preparation of Antimony."

Ralph Winfred Duncan: "The Optical Constants of Sodium and Potassium."

Robert Carithers Duncan: "The Optical Constants of Sodium and Potassium."

Engelhardt August Eckhardt: "The Optical Constants of Solid Solutions."

Samuel Weiller Fernberger: "On the Methods of Just Perceptible Differences and Constant Stimuli."

Joseph Madison McCallie: "Standardization of some of the Common Tests used in testing the Acuteness of the Vision of School Children."

Francis Norton Maxfield: "An Experiment in Linear Space Perception: A Psychophysical Study of Sensitivity in the Discrimination of Small Differences in Lines about Two Inches Long."

Reuel Hull Sylvester: "The Form Board Test."

Edward Embree Wildman: "The Spermatogenesis of *Ascaris megalocephala*, with special reference to the Two Cytoplasmic Inclusions, the Refractive Body and the 'Mitochondria'; Their Origin, Nature and Role in Fertilization."

UNIVERSITY OF MICHIGAN

Harvey Clayton Brill: "A Study of the Formation of Pyrimidines by use of Nitromalonic Aldehyde."

Henry Newell Goddard: "Can Soil Fungi Assimilate Atmospheric Nitrogen?"

Clarence W. Greene: "Polarization in the Aluminium Rectifier, with special reference to the Development of a Potentiometer Method of determining the Decay of the Counter Electromotive Force of Polarization."

James Elmer Harris: "The Elastic Properties of Bismuth Wires."

Irving Day Scott: "The Spacing of Fracture Systems and its Influence on the Relief of the Land."

Clarence Jay West: "The Salts of the Oxy Xanthenols (A Contribution to the Chemistry of Quino Carbonium Salts)."

Neil Hooker Williams: "Stability of Remanent Magnetism."

Elizabeth Dorothy Wuist: "The Morpho-physiological Life History of the Gametophyte of *Onoclea struthiopteris*."

PRINCETON UNIVERSITY

Garrett Davis Buckner: "Studies on the Silver Coulometer."

Karl Taylor Compton: "Studies in the Photoelectric Effect."

Claude William Heaps: "The Effect of Magnetic Fields on the Resistance of Metals and Conducting Crystals."

Otto Frederic Kampmeier: "The Development of the Thoracic Duct in the Pig."

Joseph Stanley Laird: "A Study of the Inclusions in Electrolytic Silver, and their Effect on the Electrochemical Equivalent of Silver and the Electrochemical Equivalent of Cadmium."

Charles Sheard: "The Ionization Produced by Hot Salts and by Freshly Heated Metal Wires."

Phillips Thomas: "A Study of the Action of Dielectrics under Applied Alternating Electric Stresses, with regard to the Loss of Energy which occurs."

CLARK UNIVERSITY

Eugene William Bohannon: "Exceptional Children and the Only Child in the Family."

John Madison Fletcher: "An Experimental Study of some of the Incoordinations of Functional Speech Disturbances."

Frank Eugene Howard: "The Pedagogy of the Emotions."

Karl Johan Karlson: "Psychoanalysis and Mythology."

John Milton McIndoo: "Instinct as related to Education."

Tadaichi Ueda: "The Psychology of Justice."

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

John Andrew Allan: "Geology of the Ice River District, British Columbia."

Norman Levi Bowen: "The Binary System: $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$ (Nephelite, Carnegieite) $\text{CaAl}_2\text{Si}_2\text{O}_8$ (Anorthite)."

Arthur Edgar: "The Equilibrium between Nitric Acid, Nitric Oxide and Nitrous Acid."

Merle Randall: "Studies in Free Energy."

Frank Finch Rupert: "The Free Energy of Concentrated Solutions."

Stuart James Schofield: "Geology of East Kootenay, British Columbia, with special reference to the Origin of Granite in Sills."

OHIO STATE UNIVERSITY

Cecil Ernest Boord: "The Action of Substituted Hydrazones upon Orthoquinones—a Contribution to a Study of the Constitution of Orthohydroxyazo Compounds."

Freda Detmers: "An Ecological Study of Buckeye Lake—a Contribution to the Phytogeography of Ohio."

David Raymond Kellogg: "The Hydrolysis of Ethyl Acetate by Neutral Salt Solutions."

George Weatherworth Stratton: "The Action of Substituted Toly Hydrazines upon Quinones."

Edgar John Witzemann: "Oxidation of Propylene Glycol."

BROWN UNIVERSITY

William Ward Browne: "Acid Production by the *Bacillus coli* Group."

John Wymond Miller Bunker: "Colon Bacilli in Polluted Oysters."

Robert Foster Chambers: "A Study of Symmetrical Tribrom Phenyl Propionic Acid."

Walter Edward Sullivan: "*Pseudopleuronectes americanus*."

INDIANA UNIVERSITY

Caroline Anna Black: "The Morphology of *Riccia frostii* Aust."

Mary Theresa Harman: "Method of Cell Division in the Sex Cells of *Tania teniaformis*."

Cora Barbara Hennel: "Certain Transformations and Invariants connected with Difference Equations and other Functional Equations."

William Logan Woodburn: "Spermatogenesis in certain Hepaticæ."

BRYN MAWR COLLEGE

Eleanora Frances Bliss: "Crystalline Rocks of the Doe Run Region, Pennsylvania."

Minnie Almira Graham: "A Study of the Change from Violet to Green in solutions of Chromium Sulphate."

Anna Isabel Jonas: "The Geology of the Avondale District, a Key to the Relations of the Wissahickon Mica-gneiss and the Shenandoah Limestone of the Piedmont of Pennsylvania."

UNIVERSITY OF IOWA

James Ellis Gow: "Embryology of the Aroids."

Fred Jay Seaver: "The Hypocreales of North America."

Franklin Orion Smith: "The Effect of Training in Tonal Hearing."

STANFORD UNIVERSITY

Charles Victor Burke: "A Biological and Taxonomic Study of the Cyclogasteridæ."

John Edgar Coover: "Formal Discipline from the Standpoint of Experimental Psychology."

Hally Delilia Mary Jolivet: "Studies on the Reaction of *Pilobolus* to Light Stimuli."

GEORGE WASHINGTON UNIVERSITY

A. L. Kibler: "Mercury Fulminate."

W. J. McCaughey: "Mineralogical Methods in Soil Investigation."

UNIVERSITY OF MINNESOTA

Francis Cowles Frary: "Equilibria in Systems containing Alcohols, Salts and Water, including a New Method of Alcohol Analysis."

Charles Eugene Johnson: "The Development of the Prootic Head Somites and Eye Muscles of *Chelydra serpentina*."

NEW YORK UNIVERSITY

Ephraim M. Ewing: "The Venous Pulse."

Albert B. Pacini: "Metamorphism in Portland Cement."

UNIVERSITY OF VIRGINIA

George Frederic Paddock: "Some Adaptations and Criticisms of Spectroscopic Orbit Formulæ with an Application to V 4 Eridani, A. G. C. 4821x."

Stephen Taber: "Geology of the Gold Belt in the James River Basin, Virginia."

BOSTON UNIVERSITY

Robert E. Bruce: "Latitude Determination."

CATHOLIC UNIVERSITY OF AMERICA

Ignatius Albert Wagner: "The Condensation of Acetone by Means of Calcium Carbide."

UNIVERSITY OF CINCINNATI

Frances Kohnky: "The Subjective Element in Mysticism."

UNIVERSITY OF PITTSBURGH

Harry Nelson Eaton: "Geology of South Mountain and the Reading Hills, Pennsylvania."

VANDERBILT UNIVERSITY

Ernest Victor Jones: "A Spectrographic Study of Tellurium."

WASHINGTON UNIVERSITY

Charles Haskell Danforth: "The Anatomy of *Polyodon*."

THE CELEBRATION OF THE TWO HUNDREDTH ANNIVERSARY OF THE ROYAL SOCIETY

THE celebration of the two hundred and fiftieth anniversary of the founding of the Royal Society of London began on Monday, July 15, when the president and the fellows received their guests informally in the rooms of the society at Burlington House. The first formal recognition of the anniversary, apart from the visit of the president and the treasurer to the king to present to him the memorial volumes on Saturday, was at noon on Tuesday at Westminster Abbey, when a special service was held. The dean of Westminster preached the sermon, taking his text from Esdras, "Truth abounds and is strong for ever." The formal reception of the delegates took place in the afternoon at Burlington House. After formally giving the delegates welcome, Sir Archibald Geikie, the president, made an address in which he traced the origin and early days of the society.

The ceremony of presenting addresses of congratulation followed. Besides the formal addresses, there were speeches by a representative of each country or dominion. The selected speakers were:

Austria-Hungary—Professor Izidor Fröhlich, rector of the Royal Hungarian University, Budapest.

Belgium—Professor Louis Dallo, Académie Royale des Sciences, Brussels.

Denmark—Professor Hector F. E. Jurgensen, University of Copenhagen.

France—M. Gabriel Lippmann, president of the Académie des Sciences de l'Institut, Paris.

Germany—Professor Dr. Woldemar Voigt, rector of the University of Göttingen.

Greece—Professor Andrew Andreades, University of Athens.

Italy—Professor Vito Volterra, University of Rome.

Monaco—Mr. J. Y. Buchanan, F.R.S., Oceanographical Institute.

Netherlands—Professor P. Zeeman, secretary of the Academy of Sciences, Amsterdam.

Norway—Professor H. Mohn, president of the Academy of Sciences of Christiania.

Russia—Dr. O. Backlund, Acad. Impériale des Sciences, St. Petersburg.

Spain—Professor Rodriguez Carracido, Real Acad. de Ciencias, Madrid.

Sweden—Count K. A. H. Mörner, vice-president, Kongliga Svenska Vetenskaps Akademien, Stockholm.

Switzerland—Professor E. Naville, University of Geneva.

Egypt—Dr. James Currie, principal of the Gordon College, Khartum.

Japan—Professor R. Fujisawa, Imperial University, Tokyo.

United States—Professor W. B. Scott, vice-president American Philosophical Society, Philadelphia.

Australia—Professor H. Laurie, University of Melbourne.

Canada—Dr. W. Peterson, principal, McGill University, Toronto.

India—Dr. F. G. Selby, late vice-chancellor, University of Bombay.

South Africa—Sir David Gill, F.R.S., Royal Society of South Africa.

England and Wales—Dr. C. B. Heberden, vice-chancellor of Oxford (universities), and Sir C. H. Read, president, London Society of Antiquaries (learned societies).

Scotland—The Very Rev. Dr. G. Adam Smith, principal of the University of Aberdeen.

Ireland—Professor J. Joly, F.R.S., University of Dublin (Trinity College).

On Tuesday evening a banquet took place at the Guild-hall. Sir Archibald Geikie was in the chair and the principal addresses were

made by Mr. Asquith, the prime minister, and Lord Morley. On Wednesday the Duke and Duchess of Northumberland gave a garden party to the delegates at Syon House, and in the evening a conversazione was held at Burlington House. On Thursday the king, the patron of the society, and the queen, received the president and council and the delegates at Windsor, and on the same afternoon the fellows attending the celebrations were at a garden party at Windsor, the royal reception concluding the celebration.

Among some 200 delegates the following were from the United States and Canada:

University of California, Professor H. C. Plummer; University of Chicago, Professor E. B. Frost; Clark University, Worcester, Professor A. G. Webster; Columbia University, New York, Dr. N. M. Butler (president); Cornell University, Ithaca, N. Y., Professor J. H. Comstock; Harvard University, Professor B. O. Peirce; Johns Hopkins University, Baltimore, Professor W. B. Clark; Leland Stanford Junior University, California, Professor V. L. Kellogg; University of Michigan, Professor W. H. Hobbs; University of Minnesota, Minneapolis, Dr. A. Hamilton; University of Pennsylvania, Philadelphia, Dr. E. F. Smith (provost); Princeton University, New Jersey, Professor J. G. Hibben (president); University of Wisconsin, Professor C. K. Leith; Yale University, Dr. A. T. Hadley (president); American Academy of Sciences, Boston, Professor E. H. Hall; Connecticut Academy of Arts and Sciences, Professor E. W. Brown, F.R.S.; American Mathematical Society, New York, Professor H. B. Fine (president); American Philosophical Society, Philadelphia, Professor W. B. Scott (vice-president); Franklin Institute, Philadelphia, Major G. O. Squier; California Academy of Sciences, San Francisco, Mr. J. D. Grant; Carnegie Institution, Washington, Dr. R. S. Woodward (president); National Academy of Sciences, Washington, Dr. A. Hague (secretary); Smithsonian Institution, Washington, Dr. A. Hague; Washington Academy of Sciences, Dr. L. O. Howard; McGill University, Montreal, Dr. W. Peterson (principal); University of Toronto, Mr. R. A. Falconer (president); Queen's University, Kingston, Ontario, Professor J. Watson; University of New Brunswick, Fredericton, N. B., Dr. C. C. Jones (chancellor); University of Manitoba, Winnipeg, Professor S. Vincent; University of Ottawa, Rev. Dr. Roy (rector); Royal Society of

Canada, Ottawa, Sir Gilbert Parker, M.P.; Nova Scotian Institute of Science, Halifax, N. S., Professor J. G. MacGregor, F.R.S.

PAUL CASPAR FREER

THE members of the Bureau of Science of the Government of the Philippine Islands have passed the following resolutions:

WHEREAS it has pleased Almighty God in His wise and inscrutable providence to remove from our midst Paul Caspar Freer, M.D., Ph.D., director of the Bureau of Science of the government of the Philippine Islands, since the time of its organization as the Bureau of Government Laboratories in the year 1901, dean of the College of Medicine and Surgery, and professor of chemistry, University of the Philippines, and founder and editor-in-chief of the *Philippine Journal of Science*, who, for many years, has been our leader, counselor and friend, and

WHEREAS at best we can do little to indicate at this time our real appreciation of him as a man and as a worker for the general good, therefore be it

Resolved, that we, the members of the staff of the Bureau of Science in Manila, Philippine Islands, do hereby express our deepest sorrow and keen feeling of personal loss in the death of Dr. Freer, and be it further

Resolved, that he holds a place of highest respect, admiration and appreciation both officially and personally in the hearts of all of us, and especially of those who were most intimately associated with him in scientific work, and be it further

Resolved, that it is the sense of the members of this institution that the Bureau of Science has suffered a very great loss and that the cause of science in these islands has been deprived of one of its most zealous and conscientious advocates, and be it further

Resolved, that we extend our sincere sympathy and condolence to his widow in her overwhelming grief, to his brother and other relatives, and be it further

Resolved, that copies of these resolutions be engrossed and sent to the bereaved widow and brother of Dr. Freer, and that they be filed in the archives of the Bureau of Science, transmitted to the Bureau of Civil Service, published in the forthcoming number of each section of the *Philippine Journal of Science*, in the newspapers of Manila, in a paper in the city of Chicago, Dr. Freer's

birth-place, and in SCIENCE, the official organ of the American Association for the Advancement of Science, of which Dr. Freer was a fellow.

For the staff of the Bureau of Science,

RICHARD P. STRONG

CHARLES S. BANKS

E. D. MERRILL

ALVIN J. COX

OSCAR TEAGUE

A. E. SOUTHARD

Committee

At Manila, Philippine Islands, this
Eighteenth Day of April, in the
Year of Our Lord One Thousand,
Nine Hundred and Twelve.

SCIENTIFIC NOTES AND NEWS

A COMMITTEE representing the engineering societies of the British Empire and the United States of America has been formed to carry into effect a proposal for the erection in Westminster Abbey of a memorial window to the late Lord Kelvin.

As already noted in SCIENCE Cambridge University has conferred its doctorate of science on Professor E. B. Frost, director of the Yerkes Observatory. At the same time the degree was conferred on the following foreign men of science attending the two hundred and fiftieth anniversary of the Royal Society: the Marchese Emanuele Paternò di Sessa, professor of chemistry in the University of Rome; Professor Pavlov, St. Petersburg University; Professor Picard, University of Paris; Professor Rubens, University of Berlin, and Dr. Warming, formerly professor of botany at Copenhagen.

On the occasion of the bicentenary celebration of the Trinity College Medical School, Dublin, the degree of doctor of science was conferred on a number of delegates, including Dr. J. George Adami, professor of pathology and bacteriology, McGill University; Dr. Franklin P. Mall, professor of anatomy at the Johns Hopkins University; Dr. Edgar F. Smith, provost of the University of Pennsylvania, and Dr. J. Whitridge Williams, professor of obstetrics at the Johns Hopkins University.

THE University of Vermont has conferred the degree of doctor of science on Professor Edward H. Williams, Jr., for many years professor of mining and geology at Lehigh University.

DR. HENRYK ARCTOWSKI, chief of the science department of the New York Public Library, was given the honorary degree of doctor of philosophy of the University of Lemberg on the occasion of its two hundred and fiftieth anniversary on May 29.

THE University of Giessen has conferred the honorary degree of doctor of medicine on Mr. E. Leitz, Jr., head of the firm of Ernst Leitz, for his contributions to the advancement of microscopy and the construction of optical instruments.

PROFESSOR CHARLES LINCOLN EDWARDS has been appointed naturalist of the Park Department of the City of Los Angeles, with the commission to plan a Zoological Park and Aquarium. In Griffith Park, with an area of 3,000 acres of mountain lands, the animals will have the freedom and atmosphere of the wild. The aquarium building, in the mission style, will be located on the ocean front cliffs of San Pedro in a marine park with tide-pools for sea-lions, sea-elephants and penguins.

SIR PATRICK MANSON, F.R.S., will retire from the post of medical adviser to the Colonial Office in London on August 15. He has been appointed a Knight Grand Cross of the Order of St. Michael and St. George, in recognition of his eminent services in connection with the investigation of the cause and cure of tropical disease. Sir J. Rose Bradford, F.R.S., has been appointed senior medical adviser, and Mr. C. W. Daniels, junior medical adviser, to the Colonial Office in London. Mr. W. T. Prout, late principal medical officer, Sierra Leone, has been appointed medical adviser to the Colonial Office in Liverpool.

WE learn from the *Journal* of the American Medical Association that on the completion of his fortieth year as member of the faculty of the University of Berne, Professor T.

Kocher was given an ovation recently, by his friends and pupils. The Swiss government, the universities and institutes sent representatives, as did many of the European surgical societies. The *Deutsche Zeitschrift für Chirurgie* issued a special volume of 818 pages as a *Festschrift* in his honor. He celebrated the occasion by presenting the university with \$40,000 to endow scientific research. It will be remembered that Kocher was awarded the Nobel prize in medicine in 1909 for his works on the thyroid. He was born August 25, 1841, and is thus in his seventy-first year.

DR. HERMANN COHEN, professor of philosophy at Marburg, has celebrated his seventieth birthday. On this occasion, Herr Siegfried Brunn, of Berlin, has given 100,000 Marks to the Jewish Institute of the university, for the establishment of a Hermann Cohen professorship.

PROFESSOR MALINS, who has held the chair of midwifery in the University of Birmingham and Mason College, has resigned, and has made the university a gift of £1,000.

A GOLD medal has been awarded by the Royal Horticultural Society to Professor R. Newstead, F.R.S., of the University of Liverpool, for his exhibit of insects injurious to cultivated plants on the occasion of the Royal International Horticultural Exhibition held in London in May last.

PROFESSOR RUBENS, director of the Berlin Physical Laboratory, has been elected president of the German Physical Society.

DR. J. REYNOLDS GREEN has been appointed Hartley lecturer in vegetable physiology in the University of Liverpool.

DR. WILHELM OSTWALD, formerly professor of chemistry in the University of Leipzig, expects to visit the United States this autumn.

DR. S. W. WILLISTON, professor of paleontology in the University of Chicago, will spend the autumn quarter of 1912 in an expedition to British South Africa. Professor Williston will be accompanied by Preparator Paul Miller, his assistant, who will spend the whole academic year in completing the work of the expedition.

DEAN E. B. GREENE and Professor G. A. Goodenough, of the University of Illinois, will attend the International Congress for the Interchange of Students in London on July 28.

PROFESSOR AND MRS. S. A. FORBES will attend the second International Congress of Entomologists to be held at Oxford, England, August 5 to 10. Dr. Forbes will go as a delegate from the Entomological Society of America, of which he is president; he will read a paper on the black fly pellagra problem in Illinois.

MR. F. W. RANE, state forester of Massachusetts, has been delegated by Governor Foss to represent the state at the second International Congress of Entomology, which is to be held at Oxford, England, August 5 to 10, 1912. At the termination of the congress, Mr. Rane will go on to the Black Forest of Germany to study forestry conditions and the gypsy moth question.

A MOVEMENT has been started in Baltimore to erect a monument to the dentist, Dr. Chapin A. Harris, who, with Dr. Horace A. Hayden, founded the first dental college in the world, the Baltimore College of Dental Surgery.

THE University of Chicago has received five thousand dollars from Mrs. Myra T. Ricketts, widow of the late Howard T. Ricketts, assistant professor of pathology in the university, to found a scholarship to be known as the "Howard T. Rickett's Prize." This prize is to be awarded annually for the best piece of research presented by any student in the department of pathology and bacteriology. Dr. Ricketts lost his life in 1910 in the city of Mexico, from typhus fever, which he contracted while engaged in the scientific investigation of the disease.

ON the occasion of the celebration of the bicentenary of the Trinity College Medical School, a bronze medallion was unveiled in the anatomical laboratory to Daniel John Cunningham, who was for twenty years professor of anatomy.

THE death is announced of Dr. Moritz Seidell, honorary professor of pharmacology at Jena.

M. FLORIO OSMOND, eminent for his contributions to the metallurgy of steel, has died at the age of sixty-three years.

THE U. S. Civil Service Commission announces examinations to fill a vacancy in the position of plant pathologist, \$2,750 per annum, Bureau of Plant Industry, Department of Agriculture; of entomological assistant (male), at salaries ranging from \$1,400 to \$1,800 per annum, in the Bureau of Entomology, and of assistant in agricultural technology for work in cotton grading, Bureau of Plant Industry, at salaries ranging from \$1,200 to \$2,250.

SINCE the summer of 1909 the joint commission appointed by the United States and Canadian governments to locate and mark the boundary line separating British territory from Alaska has been actively engaged in this work, pushing the line northward from the Yukon to Porcupine River by the end of the 1910 season. Last summer the field operations were advanced farther along that part of the one hundred and forty-first meridian which extends from Porcupine River to the Arctic Ocean, and it is believed that the present year will witness the completion of this part of the survey. Realizing that its well-equipped field organization afforded unusual facilities in this remote and rather inaccessible region for gathering much information not directly connected with the particular work of locating and marking the boundary line, the joint commission extended an invitation, which was readily accepted, to the Geological Survey of Canada and the United States Geological Survey to send geologists to accompany the field parties during 1911 and 1912, and to examine the geology along the boundary from the Yukon to the Arctic. The most satisfactory arrangement for making such a geologic examination in the two summers appeared to be to assign one of the two sections of the line to each government, as otherwise there would have been much duplication of work and the

observers would be required to traverse the whole length of both sections. Under the arrangement adopted the Canadian geologists undertook to examine the southern or Yukon-Porcupine section and the United States geologists the northern or Porcupine-Arctic section. The United States geologists last year commenced field examinations in June and carried their work northward approximately 100 miles, to the headwaters of Firth River, which flows into the Arctic Ocean. A preliminary outline of the geologic results obtained by this party has been published by the United States Geological Survey as Bulletin 520-K, by A. G. Maddren.

UNIVERSITY AND EDUCATIONAL NEWS

AN anonymous donor has given 10,000 guineas for the erection of a physiological laboratory for the medical faculty of University College of South Wales and Monmouthshire.

A MOTION has been placed on the records of the Supreme Court of the state of New York changing the official name of "The Trustees of Columbia College of the City of New York" to "The Trustees of Columbia University in the City of New York."

AT the summer session of Columbia University there are registered 3,615 students; at the University of Chicago the registration is 3,053.

DR. EDWARD DAVIDSON CONGDON, A.B., A.M. (Syracuse), Ph.D. (Harvard), instructor in anatomy at the Cornell Medical School, has been appointed instructor in anatomy at Stanford University and not at Pittsburgh as has been announced.

PROFESSOR THOMAS L. PATTERSON, head of the department of biology in the Highland Park College, has accepted an appointment as associate professor of biology and physiology in the University of Maryland School of Medicine, Baltimore.

DR. ERNST GAUPP, of Freiburg, has been appointed professor of anatomy at Königsberg.

DISCUSSION AND CORRESPONDENCE

SEX-LIMITED INHERITANCE IN CATS

TO THE EDITOR OF SCIENCE: In SCIENCE for May 17, Mr. C. C. Little, under the title "Preliminary Note on the Occurrence of a Sex-limited Character in Cats," describes first results from the mating black female by yellow male, and concludes that the black and yellow factors are sex-limited in the male cat. For some years I have been collecting evidence on this question, and have recently begun breeding experiments, the first litters from which are expected very shortly. From evidence which I have obtained from breeders, and which I propose to publish when my own experiments are sufficiently advanced to provide adequate comparison, I have no doubt that Mr. Little is correct in supposing that the male cat shows sex-limited transmission of a color-factor. That this is so has been clear to me for two years or more, and I welcome Mr. Little's further evidence in the same direction. My data, including records of from 30 to 80 kittens in each of the possible crosses between black, orange and tortoise, do not, however, entirely confirm the hypothesis which he suggests. I have evidence, from a breeder who is thoroughly reliable, that occasional black (or blue) females are produced from the cross black female \times yellow male, and also from tortoise female \times yellow male. That such black females are unusual is quite certain, and it is of the greatest importance to determine under what circumstances they occur. Their existence would seem to indicate that the sex-limitation is not absolute, but partial, as in the case of gametic coupling between members of distinct Mendelian pairs.

Mr. Little, if I understand him, assumes that both black and yellow factors are sex-limited in the male cat. I think a more probable assumption is that all gametes bear the factor for black, which appears to be hypostatic (recessive) to all other colors, and that the yellow female is homozygous, the yellow male and tortoise female both heterozygous for the yellow factor. Using the terminology X = male, XX = female, Y = yellow, y its

absence, B = black; and supposing that Y is closely, if not invariably coupled with X in the male, we have

Yellow male = $XYyBB$, producing gametes XYB, yB ;

Yellow female = $XXYYBB$, producing gametes XYB ;

Tortoise female = $XYyBB$, producing gametes XYB, XyB .

Yellow is normally completely dominant (epistatic) over black in the male, only partially so when heterozygous in the female, giving tortoise. It is possible that the exceptional tortoise-shell males are the correlative of the exceptional black females from yellow sires. If the coupling between the sex-factor X and the yellow factor Y is occasionally broken, then Y , transmitted from a male parent apart from X might perhaps behave differently from Y coupled with X , and produce a tortoise instead of a yellow male. Until further data are available, however, this kind of speculation is of little value. My main object at present is to point out that the complete solution of the problem requires large numbers of observations, so that we may know not only what exceptional conditions are possible, but also the frequency and mode of their occurrence. My own experiments are unavoidably on a small scale, and with regard to data derived from breeders, it is notoriously difficult to avoid all chance of mistake unless the cats are kept in cages, a precaution not always taken by the amateur. It is therefore very desirable that further experiments should be done on a large scale, under absolutely trustworthy conditions.

L. DONCASTER

CAMBRIDGE, ENGLAND,

May 28, 1912

"TERMS USED TO DENOTE THE ABUNDANCE OR RARITY OF BIRDS"¹

THE paper under this title in a recent issue of SCIENCE seems to be another attempt to replace spontaneous choice by labored precept,

¹ Kuser, J. D., SCIENCE, N. S., Vol. XXXV., No. 911, June 14, 1912, pp. 930-931, chiefly a reprint from "The Birds of Somerset Hills," Rahway, N. J., 1912, pp. 128-132.

to substitute mechanical uniformity for individual freedom of expression. There is little probability that we shall ever fix upon a code of mathematically exact terms denoting abundance or rarity nor is there any need of so doing. What the term, a common bird, means in one place it does not mean in another. To understand its approximate meaning we must get a conception of a writer's whole work, the character of the region, the amount of time spent in the field, and the extent of country covered. This being the case, there is little ground for objecting to the use of a set of terms indicating relative abundance, because they are not patterned after some very precise model.

Few will conclude, as Mr. Kuser does, that "usually common or usually rare are the same as common or rare." Why deny us the use of the perfectly good and expressive word "usually"? We are glad to have extra-dictionarial information concerning the exact meaning of "quite" and "tolerably," but hazard the prophecy that "quite common" and "tolerably common" will be in good standing long after our author has passed from earth away. Some of the other dicta in Mr. Kuser's paper will not impress every one as convincing, for instance: "Not uncommon is equal to common," "accidental is occasional or rare." These words have by no means customarily been used in the sense indicated, nor have "scarce" and "irregular" usually had the significance Mr. Kuser gives them, that is, respectively, reduced in numbers after having been common and sometimes common, sometimes rare. In spite of our adviser's assertion that "rare is very rare," the mere fact that the two forms often occur in the same bird list proves they have distinct meanings.

Gentlemen who seek to control the use of language usually have the opportunity to learn that they are sadly misguided. For an excellent exposition of this principle see Professor Thomas R. Lounsbury's article, entitled "Schoolmastering the Speech."² We have always had "schoolmasters," or in a Rabelaisian synonymy, pedagogues, pedants, moni-

² *Harper's*, December, 1905.

tors, dogmatists, grammaticasters, censors, hypercritics, doctrinaires, editors, recensionists, revisers, highbrows, purists, Sir Oracles, precisians, language-rectifiers, admonishers, reformers, talk-tinkers, stylists, theorists, word-catchers and speech-conservers, but usage has been little affected by their efforts. The language still pursues the sweet and even tenor of its way. Word-histories prove the authority and freedom of usage in molding the language. The objections of pedants are no obstacles to this progress; they are no more than clods in the path. The great principle to be borne in mind is that language is made for man and not man for language.

W. L. McATEE

IN SCIENCE, June 14, 1912, pp. 930-931, I see that Mr. Kuser has attempted to formulate a standard of general terms to denote specific density of populations. Though the use of such terms as "common" or "rare" is, owing to the great amount of personal equation involved in their application, unsatisfactory, there is, at present, no practical method of substituting any better or more accurate system in their place. Some writers have tried to give an approximation to the number of individuals occurring in a given unit of territory, but, owing to the difficulty of counting or estimating a moving or secretive population, the results are often little more than the expression of an opinion more or less biased by personal view-point, and nearly as much a matter of judgment as the old methods. Besides which, the results, as expressed in figures, are unfamiliar to most of us and difficult to translate into comparable conceptions.

That some system of standardization of the common colloquial terms is desirable is self-evident. How far it can be accomplished is open to discussion. The decision of just how many individuals make "common" or how few make "rare" varies so greatly with the personality and experience of the observer, the species in question and the locality studied, that absolute uniformity of use and comparability of record seems difficult if not impossible of attainment. However, if absolute

standardization can not be arrived at, it does seem possible that a comparative one can; whereby each observer's records may vary slightly from those of others yet be strictly comparable with themselves and approximately with those of others. To arrive at such a conclusion, some uniformity in the use of terms should be understood, and for such use a list of terms as before mentioned is of value.

To fulfill its mission, such a standard set of definitions should conform to the present-day average use, and the question is therefore, not what the strict dictionary or grammatical meaning may be, but what has been and is their meaning in present-day practise. Viewed in this light, I think Mr. Kuser's list is subject to criticism, and some objection can be made to his proposed use and interpretation of terms.

Should these remarks of mine be found not to tally with the conceptions of others, it will be but a concrete example of the variation in interpretation of these commonly used phrases and but another proof of the advisability of some such system of standardization.

Very Common.—Mr. Kuser says this is the same as "abundant." Are there not various degrees of commonness and does not a species become more common before it arrives at abundant? "Very common" is in such general use and carries such a clear concept that I should hesitate to discard it. At any rate, in practise it has not the same meaning as "abundant."

Usually Common.—Mr. Kuser says this is equal to "common." I think this is a mistake. According to my, and what I think is the general conception, "usually common" signifies that the species varies in numbers in time and place, but is more often common than not. It infers a rule with many exceptions.

Quite Common.—The academic and practical use of words is here confused. Though in theory the effect of the prefixing of the "quite" to "common" is neutral or slightly intensive, in practise it is diminutive and weakens the statement to "almost" or "barely common." "Quite common" is established in

our literature, is well understood, and I can see no good reason why it should not be retained, though I should prefer to use "rather common" in its stead.

Not Uncommon.—This certainly does not in practise equal the same thing as "common" nor does "not common" equal "uncommon." In either pair, one term is passive and the other active. One means a little less than "common" and the other a little more than "uncommon."

Accidental is not "occasional or rare." The word does not apply to numbers at all, but involves an explanation of a lack of numbers. A storm-blown petrel appears in the Mississippi Valley accidentally, Kirtland's warbler is noted there occasionally; both are rare there, but both are not accidental. This is a word to be used with great caution. Except in a few cases, we do not know whether an occurrence is occasional or accidental, and it is much better, unless we know certainly to use the former term, which merely expresses an observed fact, than the latter, which adds a theory to it.

Very Rare.—As a species can be "common" or "very common" so it can be "rare" or "very rare." The degrees apply to rarity as well as to commonness.

Scarce.—I can not see that "scarce" has any meaning of diminishment. In general use I think it merely refers to present conditions and comes between "common" and "rare." The word to be used in Mr. Kuser's sense is "decreasing," and to be used in its adverbial form in conjunction with other terms of number as "decreasingly common" or "decreasingly scarce."

Irregular.—This is another word that has no quantitative meaning, but deals with the constancy or inconstancy of the numerical status. It can be used adverbially with other terms as "irregularly common."

It is easy enough to criticize others' work and with the certainty that they will find it equally simple to criticize mine I here offer an alternate scale of terms and definitions that seems to me a little more satisfactory, as it agrees with general practise and overcomes

some of the difficulties about as well as can be expected.

As a basis I have taken four terms in general use that have (in my opinion) become more or less established in use and concept:

Abundant.

Common.

Scarce.

Rare.

Of course none of these terms can be defined by absolute numbers or density of population per unit of area. An equal number of song sparrows and golden eagles in a given territory would make either the former decidedly "rare" or the latter phenomenally "abundant." Therefore, in defining the terms I have tried to measure them by their effect upon the observer and not by the numerical occurrence of individuals. This, of course, has the objection of accentuating personality somewhat, but it follows the usual conception of the terms, and, if followed consistently, will make all observations of one recorder comparable with each other while affording some degree of uniformity between those of different observers.

Common.—This is the fundamental or zero of the system and all other terms must from time to time be compared with it. It is applied when individuals are noted in such numbers as to be readily found without special search. The test of commonness is when the observation of an individual, more or less, arouses little or no interest. When the observer passes by with the mental thought, "another song sparrow," and then dismisses the matter from the mind, the species is "common."

Abundant is applied when the species intrudes itself upon the senses so repeatedly that one can not help noticing it. In other words, when it is practically always present. The test for abundance is when the observer notes the numbers with a certain amount of interested surprise, and the mental ejaculation is "What! another song sparrow?"

Scarce.—Considerably less than "common." The test of scarcity is when the sight or observation of an individual arouses more or

less passing interest and self congratulation. The accompanying thought might be expressed as, "Good! another song sparrow."

Rare.—Decidedly less in number than "scarce." The test is when the appearance arouses decided enthusiasm and a thought arises such as, "Hurrah! here is a song sparrow."

With each of these terms I should advise using qualifying adverbs such as "very" and "rather"; thus we have "very rare," "rare" and "rather rare"; "very common," "common" and "rather common," etc.

Irregular, or its adverbial form "irregularly," denotes fluctuation of number at different times.

Local or Locally denotes variability in geographical distribution.

P. A. TAVERNER

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"FLORIDA WEATHER"

In reading Mr. A. H. Palmer's remarks on "Winter Weather in Florida" in the issue of *SCIENCE* for May 31, one wonders what unfortunate circumstances accompanied his experiences with Florida weather or whether he ever spent a winter in the state. One must believe from his remarks that in his opinion he has really discovered something about the climate of Florida not hitherto known.

While we do not question the accuracy of the official records he quotes, they are so arranged as to give an impression that is far from accurate. For instance, one would be led to infer that while California escaped the frosts of the past severe winter practically unscathed, Florida suffered severely; whereas the facts of the case are exactly the reverse of this. This false impression arises largely from his comparing northern Florida with the coast region of central and southern California, a comparison that is manifestly unjust. He deliberately chooses the coldest part of Florida (the record of —2 was at Tallahassee, although he does not say so in his article) for comparison with the warmest parts of California.

One would further gather the impression that while the citrus industry of California is beyond danger, that of Florida is liable to be wiped out completely. While it is true that the freeze of February, 1895, killed a large part of the orange trees to the ground, the few groves then existing in the southern part of the state, where citrus planting is now most active, largely escaped, and most of the groves further north have long been in bearing again. In other words the grower of citrus has learned what Mr. Palmer has not learned, *i. e.*, that there is a difference in climate between northern and southern Florida, and has accordingly shifted the center of the industry a hundred miles further south. He has further learned to copy the methods of the California grower in being prepared to heat his grove in case of need.

As to the frost at Miami, the author knows from personal observation that tomatoes were not injured and every gardener knows that a frost that will not kill tomatoes does not cut much of a figure. Furthermore the temperature given for San Francisco and Los Angeles (42) is perilously near the danger point for frost, a fact that Mr. Palmer fails to mention.

While every night may not be a "June" night, in the writer's opinion our coldest days, even in this part of the state, so far as personal comfort is concerned, compare very favorably with some "June" days he has experienced on the shores of Lakes Erie and Michigan.

One should not attempt to draw conclusions as broad as his on such limited data. Figures of minimum temperatures, although valuable, fall a long way short of telling the whole story as to the desirability of a state as a winter resort. The average temperature during daylight, for instance, is a point much more important.

I am impelled to write this protest because of the amount of harm such an unjust article can do to a community.

J. R. WATSON

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SCIENTIFIC BOOKS

The Mechanics of the Aeroplane. A Study of the Principles of Flight. By CAPTAIN DUCHENE. Translated by LEDEBOER and HUBBARD. Longmans, Green & Co. 1912. 231 octavo pages, 91 diagrams, 4 tables in the text and 5 in the appendix.

This is an elementary technical work on the principles of the aeroplane. It is neither accurate enough nor comprehensive enough to be called a popular treatise. It presents in rough and ready practical form the latest results of theory and experience, and therefore should prove welcome to engineers who practise aviation professionally, rather than investigate profoundly or precisely.

It is divided into four parts aggregating six chapters. The first part treats of flight in still air; the second part treats of equilibrium of the aeroplane in still air; the third discusses the effect of the wind on the aeroplane; the fourth presents one chapter on the theory and design of the screw propeller. In all the text care is taken to preserve the theoretical nature of the work, and not to cumber it with descriptions of machines, details of construction, or historical references.

The work would be improved by eliminating certain misleading passages. Thus the author states that the wind force on a plane at small angles of incidence is almost normal to the surface, whereas it is well known that the force may be very oblique at small angles, being actually tangential to the surface at zero incidence. Again he states that many constructors design their propellers with a curved leading edge because the streaky marks on the propeller-blade made during rotation, by dust particles and oil, assume this shape. As the author presents without protest or repudiation this absurd reason of the practical designer, the reader naturally infers that the author either endorses the absurdity or suspends judgment. One skilled in aerodynamics can not entertain such a reason for curving the leading edge of a propeller blade.

On the whole the book is a good presentation of the most advanced information on the

physical basis and the mechanical theory of aviation, and contains many useful and concisely solved problems that will appeal to amateurs and professionals devoted to the practical study of the aeroplane. A special commendation of the work is that it was awarded the Monthyon prize in 1911 by the French Academy of Sciences.

A. F. ZAHM

Smoke—A Study of Town Air. By J. B. COHEN and A. G. RUSTON. New York, Longmans, Green & Co. 1912.

Among the principal disadvantages attendant upon our modern civilization is the smoke produced wherever soft coal is burned. As in so many other cases, the possibility of doing away with the evil rests, to a great extent, upon the sufficient arousal of public opinion; in this instance, that there may be enacted the legislative measures necessary for the enforcing of the smokeless combustion of soft coal.

The means and methods of burning soft coal without smoke, having been the subject of numerous publications, are well known. But attention to other phases of the subject, which are so necessary for the enlisting of public sympathy, are remarkably lacking.

In point of fact, this little book by Cohen and Ruston is the first attempt to gather what little information we already possess along these lines into such form as to be accessible to and easily comprehended by the general public.

This book, therefore, takes one into a field, new to the average reader, and gives him a point of view different from that to which he is accustomed. It is, thus, eminently worth while.

The first chapter has to do with the chemical composition of soot and shows why it is obnoxious and injurious. Reliable figures are given for the amount of soot formed from a definite amount of coal burned, for the solid impurities in the air—and for the daily soot fall in various towns in England.

The effect of smoke on vegetation is treated with considerable detail and is shown in many cases to be decidedly injurious.

The effect of sulphuric acid in the air upon metal work and vegetation, here gone into at length, while interesting to know, is somewhat out of place, as the smokeless combustion of soft coal will not do away with the acid emitted from our chimneys.

The study of the diminution in the transparency of the air and the increase in fogs due to smoke forms an instructive discussion.

The chapter on the influence of coal-smoke upon health, by Dr. Ascher, is a valuable addition to the book, showing that, "there can be little doubt that coal dust smoke and soot increase the death rate from acute lung diseases."

Altogether it is a clear, concise and, above all, trustworthy collection of data concerning smoke and soot and the damage done by them.

R. C. BENNER

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General Index to a Hand-list of the Genera and Species of Birds. [Nomenclator avium tum fossilium tum viventium.] Volumes I.-V. Edited by W. R. OGILVIE-GRANT. London: Printed by order of the Trustees. Sold by Longmans & Co., 39 Paternoster Row, E. C.; B. Quaritch, 11 Grafton Street, New Bond Street, W.; Dulau & Co., Ltd., 37 Soho Square, W.; and at the British Museum (Natural History), Cromwell Road, S. W. 1912. All rights reserved. 8vo. Pp. vi + 199.

Dr. Richard Bowdler Sharpe's "Hand-list of the Genera and Species of Birds" (5 vols., 8vo) was completed in 1909.¹ Although each of the five volumes (except the first, indexed with volume II.) was supplied with an index, a general index has been prepared, under the editorship of Mr. W. R. Ogilvie-Grant, Dr. Sharpe's successor in charge of the ornithological collections in the British Museum, "to supply a much-felt want." The task of amalgamating the indexes to the five volumes was done mainly by Mr. Grant's chief assistant, Mr. Thomas Wells. We are told in the

¹ Reviewed in SCIENCE, N. S., Vol. XXXI., No. 790, pp. 265-267, February 18, 1910.

editor's preface that a good many errors and omissions were found in the original indexes, and to correct these and to provide a general index it was decided to issue the present work as a "Supplement" to the "Hand-list." It contains about 22,000 entries, and its usefulness will be greatly appreciated by those using the "Hand-list," or, in other words, by all systematic ornithologists.

The preface to the volume is by Dr. Sidney F. Harmer, keeper of zoology in the British Museum, and contains a tribute to Dr. Sharpe's long period of distinguished service as curator of birds at the museum.

J. A. A.

Heredity and Society. By W. C. A. WHETHAM and C. D. WHETHAM. Longmans, Green and Company. 1912. Pp. 190.

Of late years the attention of all who have at heart the welfare of mankind in this country has been attracted by two main facts: first, the reduction of the birth rate in the more progressive and effective part of our population to half or less than half of what it was formerly, and the great increase in the number of inmates of institutions. Indeed, the proportion of our population that receives state care has nearly doubled in the ten years from 1890 to 1900, and shows an increase much larger than that of the population from 1900 to 1910. This increasing care of the defectives is a heavy burden. One seventh of the income of the state of New York goes to maintain and enlarge the state institutions for insane and other defectives—in some recent years the proportion has risen to one fifth, and it tends to increase. In view of these facts the inquiry has naturally been raised: What is the cause of this increase and what is the way to stop it? And the answer has come back from the students of heredity, carrying with it overwhelming conviction: the defectives are *bred*, and the way to stop the rising cost of their care is to stop breeding them. We are brought to our present pass by the care we have taken to protect, rear and let breed, the worse elements, while discouraging the reproduction of the better.

In England the same general phenomena that strike us here are evident, and a eugenics movement has gained great headway there. Among the leaders in this "movement" have been Mr. and Mrs. Whetham whose "Family and the Nation" has had a great influence. The present work is destined to play an equally important part. It consists of a series of thoughtful and interesting essays touching the biological aspect of the family. One can not summarize the essays, and most of them are beyond criticism. They must be read.

In the chapter on variation and heredity some of the well-known cases of family genius are cited and some new ones, based on studies of a Biographical Dictionary, are given. The authors point out that the explanation of why some men of distinction have sons of distinction and some do not depends on the kind of marriages the men make. It might have added that the reason why geniuses are rare is because, depending on recessive conditions, they will reappear in the next generation only when two strains with the tendency to like genius are brought together.

In the essay on natural selection the disastrous consequences to the race of extensive sanatoria for consumptives and of eliminating the death penalty are suggested; but there is far more to be said on this subject than the authors say in this chapter. In the essay on the biological influence of religion, the authors point out that the hardship that the Jews have undergone in the past has given them racial strength and that in face of a more humane treatment they may be killed off by kindness. In how far may the keenness and shrewdness of the Jew be due to the elimination of those who were not shrewd enough to escape their persecutors?

The two essays on the position of women contain much food for thought. The incursion of women into the industrial field as wage earners coincides in time with the fall in birth rate. And in so far as the best women are lured into professional and political life, or fail to become mothers, the best bearing branches of the racial tree are being cut off—

flowers of the most precious strains in the garden of life are being plucked before they produce seed.

The essay on heredity and politics is one of the best in the book. A successful nation is a powerful nation, and the authors conclude: "A 'theory of power' which takes account of modern biological knowledge in a strenuous effort to improve the physical, mental and moral state of the race, by both environment and heredity, and by their interaction one on the other, seems to us a good basis for political endeavor." Increasing the men of genius will make possible improved environment, but if racial efficiency fall civilization must decline. And the civilized nations spend their substance in caring for the unfit for whom the fit are taxed to such an extent that they can not carry the added expense of children. So it has come about that only the weakling can afford to have children in unlimited numbers, since the state will care for *their* children. The handicap on the fit is too heavy; it is they, and not the unfit, who are, in effect, being sterilized. A governing class becomes such and maintains itself by virtue of its inherent strong traits. Even in democratic America the opportunities afforded by business have lured the strongest men into it, and so "big business" has come to constitute the governing class. And as between nations, that which breeds the most of the best blood, while taking advantage of the advances of science and sanitation, will eventually surpass the others and inherit the earth.

C. B. DAVENPORT

THE INHERITANCE OF SKIN COLOR

THE mulatto is frequently instanced as a "blend"; and an exception to the Mendelian scheme of inheritance in that he is supposed to breed true. This position, I believe, represents an off-hand judgment based on insufficient evidence or faulty observation. I have seen a number of unquestionable cases of "reversion" to grandparental skin color among the fraternities of mulatto crosses. In numerous instances one of the third gen-

eration is either darker or lighter than either parent, *i. e.*, he has the skin color of his negro grandmother or his white grandfather, this being the invariable nature of the cross.

A man is a combination of thousands of characters; skin color is only one of these. When one considers the offspring of mulattos one must remember that such may have a negro skin associated with a European nose, or negro lips with white skin. One meets with plenty of mulattos that from the standpoint of skin color alone are white, brunette or blond; but one is not deceived as to their extraction since negroid features appear in combination. The probable explanation of the general opinion that mulattos breed true, contrary to the Mendelian principle of segregation, is due to this fact of failure to dissociate skin color from other facial characteristics. The Davenports¹ cite five cases of undoubted segregation of skin color in the third generation. Such families are fairly common in the south. I have shown, moreover, that histologically there is no difference between the skins of blonds, brunettes, mulattos and negroes, except in the abundance of identical pigment granules.² Histologically, many mulatto skins can not be told from brunette skins.

The heredity of skin color in crosses between negroes and whites unquestionably follows Mendelian laws. The mulatto shows the dominance (frequently imperfect) of the deeper pigmented condition. In the next succeeding generation there is again a segregation of negro and white skin colors.³ The fact, however, that the first generation of

¹ *Am. Nat.*, Vol. 44, 1910.

² *Am. Nat.*, Vol. 45, 1911.

³ The same is true with respect to an extensive Indian-negro cross which occurred in Amherst and Nelson counties, Va., resulting in the loss of an entire Indian tribe. I am told that in many families one or several of the children are distinctly more Indian or more negro than the prevalent type of the cross. Here again the negro skin color seems dominant to the Indian; on the contrary, the Indian type of hair apparently dominates over the kinky negro hair.

mulattos is frequently not as dark as the negro parent, and among the second (F_2) generation one or several may be darker than the darkest mulatto parent and one or several lighter, without being quite as dark or as light as the negro or white grandparent respectively, suggests strongly that a complex of factors is involved.

The fact of the apparent histologic identity between brunette and mulatto skins; and the further fact that under protracted exposure to extremes of heat and sun the number of pigment granules is increased in white skin, indicates that pigmentation (dark skin) as evidenced in the negro is an instance of the inheritance of an acquired character. The least that makes a negro a negro is his dark skin. Life-guards in September are frequently almost as black. A negro is specifically such for mental perhaps more than for physical characteristics. Moreover, the negro originally hails from tropical regions; he has been for unknown periods of time exposed to the hot tropical sun. In foreign lands he thrives best in hot climates. Pigmentation in him has probably arisen as a response to a protective demand against the rays of the sun, just as whites now acquire a "tan" under similar less extreme and less prolonged conditions. This line of reasoning would appear cogent enough, but unfortunately it can not be experimentally tested. In the absence of such test it must remain simply a speculation.

Moreover, if Kingsley's quotation in "At Last" of a description of the inhabitants of Saba by the Bishop of Antiqua is to be trusted, the results of one of nature's experiments along these lines militates against the speculation. The Bishop spoke of them, Kingsley says, as "virtuous, shrewd, simple, healthy folk, retaining, in spite of the tropic sun, the same clear white and red complexion which their ancestors brought from Holland two hundred years ago—a proof, among many, that the white man need not degenerate in these places."

The two most obvious explanations of negro

*P. 23 (ed. 1910, Macmillan & Co.).

deep pigmentation are the one outlined above, *i. e.*, acquired in response to a peculiar environment and transmitted; and as inherited from anthropoid ancestors. The evidence yielded by the inhabitants of Saba of the West Indies renders inadmissible the first. What facts support the latter interpretation?

In the first place the negro is a primitive type of man, as indicated by numerous anatomic marks (*e. g.*, relative length of arms and legs, male external genitalia—prepuce covers glans—shape of nose, use of hallux, etc.) which are more or less infantile European characters. He apparently stands much closer in the evolutionary scale to the anthropoid apes, with pigmented faces. The negro may have inherited his dark skin from his pigmented pre-man ancestors. He may be habitually an inhabitant of the tropics because he alone could survive in that climate, or because he was best suited and thus more comfortable there. The dark-skinned races, like the Italians and Spanish, and finally the brunettes of the Anglo-Saxon race, may owe their pigmentation to negroid ancestry. The connecting link may well have been the negro slaves of Roman times, and the conquering Teutons.

Moreover, anthropoid ancestry may account more directly, *i. e.*, without negroid intervention, for the pigment of "whites"; or, as in numerous other instances, so in the case of pigmentation, we may simply be dealing with an instance of parallelism. Similar results of varying degrees may have been attained under the influence of similar conditions, at various times and various places. It seems impossible at present to arrive at a definite conclusion. Complete knowledge on this point may perhaps never be forthcoming. The above discussion indicates the possible origin of a multiplicity of factors in skin-color determination. However, regarding the histologic similarity between light and deep pigmented skins and a measure of segregation among the children of black-white crosses there remains no question.

H. E. JORDAN

UNIVERSITY OF VIRGINIA

SPECIAL ARTICLES

A REVERSAL OF THE ROWLAND EFFECT

THE result of Rowland's Berlin experiments showed that a wire having a supercharge of negative corpuscles, moved longitudinally in a plus direction, and a wire having less than a normal charge, moved in the opposite direction, would produce the same external field.

In a paper just being issued by the Academy of Science, of St. Louis, the writer shows that when this external field is imposed upon a wire, the corpuscular column within the wire, and the wire itself, are moved in opposite directions.

A copper wire having a diameter of about 0.2 mm. and a length of 55 cm. is placed within a horizontal glass tube of three or four mm. diameter and 50 cm. in length. About 1.5 cm. of the wire at each end is bent at right angles and hangs vertically. Spark knobs on long rods connected with the terminals of an eight plate influence machine, are placed directly over the ends of the tube. A condenser of sheet glass having an area of tin-foil on each side of 1,000 or more sq. cm. is connected with the discharge rods. The spark length was about 4 cm. at each terminal. Sparks passed into the side of the wire at the ends of the tube, at intervals of one to three seconds, depending upon the length of the spark. The machine was driven by a motor. The end of the wire was observed by means of a telescope magnifying about 27 diameters.

No motion of the wire due to a single spark can be observed, but after four or five sparks have passed, one can easily see that it has moved.

The ends of the wire are slightly lifted as the potential rises, and drop when the spark passes.* The entire wire is somewhat shaken by the spark, and the effect is to somewhat diminish friction. The interaction between the ends of the wire and the surrounding air is very slight, but it is directed at right angles to the direction in which the wire creeps.

In one case the effect of 3,500 sparks caused the wire to creep over a distance of 1.2 cm.

The paper contains other evidence that such a solid conductor has the properties of the positive column. In one case a $\frac{1}{4}$ ampere fuse wire in a tube filled with coal oil was fused by a single spark, and became solid again at the instant when it had buckled into a regular series of longitudinal waves. In one case the compression halves of the waves separated into minute spheres, there being about a thousand of them distributed quite uniformly over a half meter of the tube.

No creeping of the wire could be observed, when the ends were dipped into mercury cups and a separately excited dynamo having a terminal potential of 175 volts was momentarily connected with it. Such effects have been observed when high potential discharges wholly outside of the wire have passed between the terminals of the influence machine. These effects have not yet received careful attention. The action of the coherer is of this character.

FRANCIS E. NIPHER

THE PREPARATION OF UNBROKEN POLLEN MOTHER-CELLS AND OTHER CELLS FOR STUDIES IN MITOSIS¹

SOME recent investigations in the study of pollen mother-cells without the use of the microtome have made it evident that there are certain advantages in preparing and studying unbroken cells for investigation in mitosis. Those in the Bureau of Plant Industry who have examined this method have suggested that a short paper be presented to this society, in order that other workers may try out this method and cooperate in improving its technic. The method seems to be capable of quite wide application in karyokinetic study.

The stamens of a large percentage of our flowers yield the unbroken pollen mother-cells with very little difficulty. Such plants as the grasses, including our grains, supply an abundance of material by simply placing the anthers in a drop of water, cutting the tips with a sharp scalpel and gently tapping them with

¹ Read before Section of Botany, American Association for the Advancement of Science, 1911 meeting, Baltimore, Md.

the point of a dissecting needle. The pollen mother-cells float out uninjured. Most other genera are easily treated in the same way. A few genera present difficulties; *e. g.*, the Malvaceæ, where the anthers are so charged with mucilage that the mother-cells can not be handled successfully without considerable trouble.

Before passing to the technic, which is exceedingly simple, I wish to say that the method can readily be adapted to study of the cells of more compact tissues by the simple process of teasing out with needles a few cells and separating them from the rest of the tissue. Although the microtome method is of extreme value to every worker, it has the tendency of tyrannizing over all other methods, some of which are unquestionably better for special purposes.

The killing of the pollen mother-cells can be done either while they are still in the anthers or after their separation. I have found weak Flemming's solution excellent, but Bouin's solution, on the whole, the better for this purpose. It has long been a favorite of the zoologists, but rather neglected by botanists. The formula is:

| | |
|---------------------------------|----|
| Pierie acid, sat. aq. sol. | 75 |
| Acetic acid, glacial | 5 |
| Formalin, commercial | 20 |

Fix 4 to 8 hours; wash with 50 per cent. alcohol until no color remains, in which the material may then be kept indefinitely.

After killing and washing, the pollen mother-cells are stained in toto by any satisfactory method. I find that both Heidenhain's iron-hematoxylin and Hermann's modification of Flemming's triple stain are especially good. The latter works vastly better than the regular Flemming stain. The formula is:

| | |
|-------------------------------|----|
| Safranin, water soluble | 1 |
| Alcohol | 10 |
| Anilin water | 90 |

Stain 4 to 8 hours; wash in 50 per cent. alcohol and, if necessary, in acidulated 50 per cent. alcohol. Pass into

| | |
|----------------------|----|
| Gentian violet | 1 |
| Alcohol | 10 |
| Anilin water | 90 |

Stain 2 to 6 minutes; wash in water. Pass into Orange G., aq. sol.

I find the concentrated aqueous solution too intense, therefore dilute it with 9 volumes of water. Stain 1 to 3 minutes. Wash quickly in 50 per cent. alcohol and finish with absolute alcohol.

The material is cleared in cedar oil or, where dampness is a drawback to this method, in oil of cloves. There need be no shrinkage whatever in the finished preparation and there can be practically no disturbance in the arrangement of the cell contents.

Pollen mother-cells thus prepared present to the investigator the original packages with unbroken walls, from which no histological particle has escaped. The karyokinetic figures are complete. The chromosomes are all in situ, not sliced up into incomplete ribbons that need to be matched in successive sections, but each one complete and undisturbed. The whole machinery of mitosis, as well as all the adjacent cell contents, make an unbroken unit. The picture under the eye is that of a lot of spheres, transparent, translucent, revealing the contents, with as little chance of artifacts as is possible by human methods.

By mounting such cells in a somewhat limpid medium, such as heavy glycerine or thin Canada balsam and placing a triangular blotting-paper at one side of the cover-glass, the cells may be rolled over under the observer's eye, presenting to view all sides of the karyokinetic spindle and enabling one to count the chromosomes, to notice their position, and to study the entire mechanism with an ease and an absolute certainty that no series of sections can possibly equal.

Three points in this method deserve emphasis:

1. *The comparative ease with which pollen mother-cells can be secured in an unbroken and perfect state, and prepared for observation as to their internal structure.*

2. *The positiveness of interpretation that can be secured by this method in contrast to*

the vexing uncertainties of microtome methods, with which we are all too familiar.

3. *The great saving of time* in arriving at results, because of the elimination of the processes involved in imbedding and sectioning the material.

It may here be stated that a preliminary examination of the pollen mother-cells and of cells secured by needle dissection is greatly aided by the use of a concentrated solution of chloralhydrate, 8 parts of chloralhydrate to 5 of distilled water. This is far better for general use than phenol, eau-de-Javelle and similar clarifying reagents. It will enable the worker to tell at once if the cells under observation are in that particular stage of karyokinesis that it is desired to secure, as the spindles and chromosomes are rendered sufficiently visible to determine the mitotic stage. The regular treatment above described can then be carried out.

The writer would be thankful to hear from any members of the society who, upon investigating the foregoing suggestions, have adverse criticisms to offer or suggestions of improvement to make.¹

ALBERT MANN

OFFICE OF AGRICULTURAL TECHNOLOGY,
U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.,
December 15, 1911

RESULTS OF PURE CULTURE STUDIES ON PHYLLOSTICTA PIRINA SACC.¹

In the summer of 1911 a study of *Phyllosticta* in connection with the frog-eye leaf spot

¹ Before presenting the above paper I tried to find if a description of this method had been previously published, but could find no trace of it. Since the meeting of the association I find that Professor E. H. Campbell describes a similar process in *Bull. Torrey Bot. Club*, Vol. 17, p. 117. As, however, Professor Campbell's article does not agree in technic with my own, and as it is also evident that this desirable process is not widely used, I think it desirable to publish the paper together with this reference.

¹ Paper No. 17 from Laboratory of Plant Pathology, Virginia Agricultural Experiment Station.

of apples was begun at the Virginia Experiment Station under the direction of Dr. H. S. Reed. Four distinctly different types of *Ph. pirina* were isolated from leaves collected at Blacksburg, Va., by the poured plate method. The different types are possibly elementary species in the De Vriesian sense of the term or pure lines according to Johannsen's use of the term, but will be called strains in this preliminary report.

Microscopically there is much similarity in these strains, except in Nos. 1 and 4 where chlamydospores are produced. The conidia of all four are identical in all characters and the mycelium of only one can be told from the others. The conidia are one-celled, elliptical, hyaline, sometimes with two oil drops. When grown on the same medium no difference in size is noted. On apple leaf agar these spores measure on the average 2.2×4.8 microns. The manner of pycnidia and conidia production is the same with all strains.

The macroscopic characters are quite different and any strain may be easily recognized in pure culture. For the sake of convenience these strains have been numbered 1, 2, 3 and 4. So far they have been grown on only three media, viz., apple leaf agar, apple fruit agar and synthetic agar made according to the following formula:

| | |
|---------------------------------------|------------|
| NH ₄ NO ₃ | 10.0 g. |
| K ₂ HPO ₄ | 5.0 g. |
| MgSO ₃ | 2.5 g. |
| Cane sugar | 50.0 g. |
| Agar agar | 20.0 g. |
| H ₂ O | 1,000 c.c. |

Descriptions of test-tube cultures of these four strains of *Ph. pirina* on the three media used and some microscopic features follow:

STRAIN NO. 1

Apple Leaf Agar.—Growth diffuse; mycelium brownish in mass; aerial hyphae short, snow white, sparse except at top and sides of slant or sometimes in patches on surface of culture; pycnidia small, very dark brown to

black, erumpent, produced at random mostly near line of streak.

Apple Fruit Agar.—Growth very abundant; aerial mycelium growing in very dense, greenish gray patches in center and whitish around edges of culture; pycnidia black, small, abundant, produced mostly along line of streak.

Synthetic Agar.—Growth very thick and somewhat stromatic along middle; greenish-black and white on surface, usually with the white in the central part of the culture with a greenish-black band around it. Surface becoming black all over with age.

Microscopic Features.—Conidia, mycelium, pycnidia typical. Large numbers of one-celled, black chlamydospores produced on mycelium by simple swelling and thickening of certain cells. These chlamydospores have germinated after six months' drying in the laboratory and produced typical colonies of the fungus again. These spores are thick-walled and resistant and no doubt aid in tiding the fungus over unfavorable conditions.

STRAIN NO. 2

Apple Leaf Agar.—Growth diffuse; mycelium very light brown in mass; aerial mycelium practically none; pycnidia extremely abundant, produced usually over the whole surface of the culture with a distinct concentric ring formation even in tube cultures. Sometimes the pycnidia are produced so thick and close along the line of streak that they form a well-marked black line. Conidia ooze out in distinctly pink masses. This character alone serves to distinguish No. 2 from the others. This strain is a very prolific spore producer.

Apple Fruit Agar.—Diffuse; numerous pycnidia mostly in a wide strip along line of streak with a few scattered ones at base of slant. Aerial hyphæ short, gray all over the surface of culture. Spore masses pink.

Synthetic Agar.—Diffuse; pink; with long, fluffy, pinkish-white aerial mycelium covering surface of culture and growing up on sides of tube. In some of the tubes this aerial mycelium has a bright-green cast at apex and

base of culture. Pink pycnidia very abundant all over the surface and some even produced up on the sides of the tube above the agar. A decided tendency to concentric rings is noted.

Microscopic Features.—Conidia, mycelium, pycnidia typical. No chlamydospores.

STRAIN NO. 3

Apple Leaf Agar.—Diffuse; mycelium dark brown in mass; aerial hyphæ gray, matted together, rather abundant over most of the surface. Pycnidia abundant, very small, black, erumpent, quite evenly distributed over the surface of the culture with some tendency to concentricity of arrangement. Agar turning quite black throughout.

Apple Fruit Agar.—Very diffuse but shallow. Surface covered all over with a dense growth of long, greenish-gray aerial mycelium. By holding to light the numerous black pycnidia can be seen through the aerial mycelium arranged in concentric rings.

Synthetic Agar.—Growth abundant; surface covered with a pink mycelial mass; aerial hyphæ very short, pink. Pycnidia inconspicuous.

Microscopic Features.—Same as No. 2.

STRAIN NO. 4

Apple Leaf Agar.—Diffuse; mycelium in mass very dark; aerial mycelium abundant, gray, quite dense. Pycnidia minute, black, abundant, evenly distributed, inconspicuous. Distinct concentric rings have been noticed, due to difference in color of different zones of the mycelium.

Apple Fruit Agar.—A very dense growth of short, greenish-gray aerial mycelium forming a mat over surface. Pycnidia very abundant, minute, inconspicuous, black, evenly distributed.

Synthetic Agar.—Dense stroma-like mass, greenish-yellow on surface. In some tubes the green is very pronounced around the edges, while yellow predominates in the center. Pycnidia inconspicuous.

Microscopic Features.—Mycelium rather larger than in other strains and noticeably

darker, with a few one- to several-celled, dark brown to black chlamydospores.

The above descriptions will serve to distinguish these strains readily. Details of morphology and results of more culture work will be reported later. Since these four strains were so easily obtained last summer it is very likely that more strains may be isolated by extending the work and the field. This difference in strains of *Ph. pirina* may account for the fact that investigators disagree as to the parasitism of *Phyllosticta*. They may have worked with different strains, some of which may be parasitic, while others are purely saprophytic or, at most, facultative parasites. Inoculation experiments to throw further light on this phase of the subject are now under way and results will be reported in a later publication.

C. H. CRABILL

BLACKSBURG, VA.,

May 1, 1912

THE NORTH CAROLINA ACADEMY OF SCIENCE

THE eleventh annual meeting of the North Carolina Academy of Science was held at the University of North Carolina, Chapel Hill, on Friday and Saturday, April 26 and 27, 1912.

The meeting of the executive committee, held early in the afternoon of the first day, was followed by a general meeting for the reading of papers. At the night session the academy was welcomed to Chapel Hill by President Venable, of the university, and then President H. V. Wilson, of the academy, delivered his presidential address, "Zoology in America before the Present Period." Next Professor A. H. Patterson gave a demonstration of luminous electric waves. Then by invitation Dr. Thos. W. Pritchard read a paper, "Wood Distillation," descriptive of the fitting up and working of a plant at Wilmington, N. C., for the utilization of waste pine wood. At the same hour Dr. W. S. Rankin, secretary of the state board of health, delivered a lecture on hygiene and sanitation before the student body of the university in Gerrard Hall.

Adjournment was then had to the hospitable home of Dr. Isaac H. Manning, where a smoker was given the members of the academy by the local members.

On Saturday morning at 9 A.M. the academy convened in annual business meeting. Reports were made by the secretary-treasurer and by the several stated committees. Five new members were elected. These with the 85 members on the roll on January 1 give a total membership of 90. The report of the secretary-treasurer showed that in membership, in interest shown in its work and in its finances, the academy has never been in better condition.

The following officers were elected for the ensuing year:

President—C. S. Brimley, Raleigh.

Vice-president—John F. Lanneau, Wake Forest College, Wake Forest.

Secretary-treasurer—E. W. Gudger, State Normal College, Greensboro.

Additional Members of Executive Committee—Julian Blanchard, Trinity College, Durham; S. C. Clapp, State Department of Agriculture, Raleigh; John A. Ferrell, State Board of Health, Raleigh.

At 9:30 the academy and the North Carolina Section of the American Chemical Society held a joint meeting, at which Dr. J. E. Mills, of Columbia, S. C., presented a report on "Molecular Attraction and Gravitation." Following this the reading of papers on the program of the academy was resumed.

The total attendance was 31 out of a membership of 90. In addition to the special papers already noted, there were 29 numbers on the program. Of these four were read by title, the other 25 were given in order when called for. Two things characterized the meeting. First the number of papers dealing with hygiene, sanitation and public health; and second the discussion which followed the presentation of nearly every paper.

In addition to the presidential address and other papers previously noted, the following were presented:

Notes on the Distribution of the More Common Bivalves of Beaufort, N. C.: HENRY D. ALLER, Director U. S. Fisheries Laboratory, Beaufort, N. C.

Of the approximately 90 species of bivalves found in the vicinity of the U. S. Fisheries Laboratory at Beaufort, N. C., 39 are considered in this paper. Since those found sparingly and those dredged in deeper water offshore, or those represented by valves cast up on the beach, are not available for scientific purposes, only the more common forms are dealt with. It is the purpose

of this paper to indicate which species are available in a living condition, specific localities where they may be found and so far as possible to give some idea of their abundance.

While a paper of this kind is of necessity incomplete, it is hoped that it may be of service to prospective investigators by pointing out what material they would have at their service under ordinary conditions at Beaufort.

The full paper is published in the current number of the Bulletin of the North Carolina State Board of Health.

The Value of Vital Statistics and their Relation to Public Health: WARREN H. BOOKER, State Board of Health, Raleigh.

Vital statistics are valuable to the nation, since they enable us to study at close range the general movements of mankind, and to measure quickly the effect of any line of action on these movements. We should know as much concerning life and health conditions throughout the state and country as we now know about crop and weather conditions.

Vital statistics are valuable to the individual in many legal questions involving facts concerning births and deaths.

Students of medicine and sociology find the study of vital statistics very profitable.

The greatest value of vital statistics is found in connection with their relations to public health work. They indicate the kind of work that is most needed; also the efficiency of that work. Cities, towns and localities having abnormally high preventable death rates can readily be found and shown where and how to take the necessary steps to reduce these death rates. Reduced death rates will eventually form the measure of public health work.

The full paper will appear in the current number of the *Journal of the Elisha Mitchell Scientific Society*.

Further Notes on the Yellow-fever Mosquito at Raleigh, N. C.: C. S. BRIMLEY, Raleigh.

Describes their great abundance during the summer of 1911, and gives possible reasons for the same.

This paper is published in the current number of the *Journal of the Elisha Mitchell Scientific Society*.

Race Preservation: Rev. GEORGE W. LAY, Rector of St. Mary's School, Raleigh, N. C.

All nature is one, and there is unity in the one plan that includes natural science and religion. Natural science has turned over part of its sub-

jects to other departments, *e. g.*, light and sound belong to psychology as well as to physics. In eugenics natural science must go beyond the purely moral forces of evolution, and include the mental and moral forces of mankind. Environment must likewise include the mind and will of man as well as things purely natural.

The two great forces which govern natural evolution are the appetites, which secure the preservation of the individual in one case, and of the race in the other. Nature works preeminently for the race and is prodigal with individual life. When the mind of man enters into the methods that are applied to the breeding of the lower animals, a new element is added. He has used both the above laws in breeding and has sacrificed the individual to the race, as nature does. The results have been beneficial, and have been attained much more quickly than could be the case under nature alone, and have been in accordance with a preconceived plan. The resulting breeds are better suited to their environment only in case the mind of man is added to the purely natural forces as a part of that environment.

In eugenics, which is the effort to improve the breeding of human beings, the moral and religious principles of mankind are added as a new force to those previously mentioned. Here man has largely disregarded the natural forces that sacrifice the individual to the race, and has therefore worked only to preserve the individual. The result has been a partial failure, since the natural forces that preserve the race, largely at the expense of the individual, have been ignored.

The scientist and moral teacher must learn from each other and help each other. The scientist must recognize mental and spiritual things as true forces in the evolution of the human race, and the moralist must recognize that both the purely natural forces, working through the two kinds of appetites whose misuse leads to the deadliest sins, and on whose nature the two great sacraments are founded, are no less a part of the divine plan than those spiritual forces which constitute the special function of religion. We can not interfere with the great plan of the universe, or use any of its forces, unless we consider it as a whole, whose parts are in complete and necessary harmony.

To be published in full in the Bulletin of the North Carolina State Board of Health.

Notes on the Larvæ of the Marbled Salamander: E. W. GUDGER, State Normal College, Greensboro.

Larvæ one and a half to two and a half inches long, with external gills, have been taken in brooks in the college park for several years past. This spring some thirty or forty were taken in a muddy pool in the same park. When caught these were nearly colorless, but when exposed to the light in aquaria set before windows in the laboratory they very quickly became pigmented. These were first thought to be the young of the common salamander which had retained their gills over winter, but discussion of the paper elicited the interesting information from Mr. C. S. Brimley that the Marbled Salamander lays its eggs in the fall; these are hatched and the larvæ retain their gills over winter, losing them in the late spring. Some kept by the writer for a month now show only stumps of these structures.

The Gloomy Scale, an Important Enemy of Shade Maples in North Carolina: Z. P. METCALF, Agricultural and Mechanical College, West Raleigh.

This paper summarized very briefly the results of three years' experiments carried on by the State Department of Agriculture for the control of this insect. A brief history of the insect was also given, together with some notes on its present distribution and destructiveness and life history.

To be published in full in the current number of the *Journal of the Elisha Mitchell Scientific Society*.

Two Parasitic Hymenomycetes: GUY WEST WILSON, Agricultural and Mechanical College, West Raleigh.

Attention is called to the attacks of apples in the Piedmont section of the state by *Septobasidium pedicellatum* (Schw.) Pat., which also occurs over a considerable area of the southern states on various hosts. *Fomes roseus* (Albert & Schw.) Cooke is also noted as causing a disease of the red cedar, locally very destructive in eastern North Carolina.

Note on the Fundamental Bases of Dynamics: WM. CAIN, University of North Carolina, Chapel Hill.

Defining mechanics as that science which treats of matter, at rest or in motion, under the action of force; weighing, by both the equal armed balance and the spring balance, is fully discussed and formulas presented. Mass and force are then discussed for both the engineers' and the absolute systems.

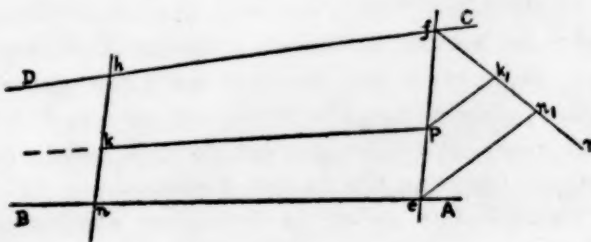
This paper will appear in the next number of the *Journal of the Elisha Mitchell Scientific Society*.

Discovery of Some New Petroglyphs Near Caicara, on the Orinoco: T. A. BENDRAT, University of North Carolina, Chapel Hill.

In the winter of 1908 and 1909, while surveying the region about Caicara, Venezuela, the writer discovered some new petroglyphs, which belong geographically and genetically to the same large group of stone-carvings found scattered over a wide area which is bounded by the Orinoco, the Atabapo, the Rio Negro and the Cassiquiare. While Alexander von Humboldt mentions only two petroglyphs from the region of Caicara, "el sol" and "la luna," of which the writer saw only "el sol," neither he nor any other traveler who ever touched that point seems to have known any of the stone-carvings found by the writer. These newly discovered petroglyphs occur on the banks of the Orinoco and in the adjacent forest. They may be divided up into three distinct groups, one representing the simplest type and consisting of almost geometrical circles, one in the other, the center of the most inner one being hollowed out; another one group of a more complicated type and of more fantastic design, of which only one figure was found; and a third group that evidently represents the highest type in the development of this art of petroglyphy and that comprises "el sol," that was already known to Humboldt, and the new petroglyph that was discovered by the writer, namely, "el tigre." All these petroglyphs are supposed to have been produced in prehistoric times. As to their meaning there exists quite a number of theories. The writer holds the view on the base of extended studies in fetichism that they represent records of earlier and later fetichism, while they have served, at the same time, as an indirect means to develop the art of sculpture that grew out of the art of petroglyphy.

To be published in full in the next issue of the *Journal of the Elisha Mitchell Scientific Society*.

Solution of the Draftsman's Difficulty—To draw from a given point a line which, if extended, would pass through the meeting point of two given lines whose point of meeting is beyond reach: J. F. LANNEAU, Wake Forest, N. C.



Let P be the given point and AB and CD the given lines intersecting at a point beyond reach.

Construction.—Through P draw any line, cutting AB and CD at points e and f ; and at some distance from fe , draw hn parallel to fe . Draw fr , at any convenient angle with fe . Take fn equal to hn . Draw Pk_1 parallel to en_1 . Lay off nk equal to n_1k_1 . Then Pk is the line sought. If produced, it would pass through the distant intersection of AB and CD . (Proof omitted.)

Note.—When the given point P is not between the given lines, the above construction still applies. In this case, put f and h on the line furthest from P .

George Marcgrave, the First Student of American Natural History: E. W. GUDGER, State Normal College, Greensboro.

George Marcgrave was a member of the Dutch expedition to Brazil under Johann Moritz, Count of Nassau-Siegen, during the first half of the seventeenth century. He assiduously studied the animals and plants of Brazil during the years 1638–1644. In 1648 his drawings and observations under the title “*Historiæ Rerum Naturalium Brasiliæ*” were published jointly with the “*De Medicina Brasiliensi*” of William Piso under the general title “*Historia Naturalis Brasiliæ*.” Marcgrave’s part of this work covers 303 folio pages, in which he describes 301 plants with 200 figures and 367 animals, of which 222 were figured. Of these 668 forms practically all were new to science and probably none of the 422 figured had ever been drawn before.

Marcgrave knew nothing of the classification of flowers based on stamens and pistils or of fishes by the count of fin rays, but his descriptions are for the times remarkably clear and his drawings sufficiently exact for the plant or animal to be unmistakably recognized. No country in its early exploration has ever had such a great work published on its natural history.

The full paper will shortly be published in *The Popular Science Monthly*.

Capture of Raleigh, N. C., by the Wharf Rat: C. S. BRIMLEY, Raleigh.

Up to March, 1909, the only species of house rat seen by the author in a residence of over twenty-five years was the roof rat (*Mus alexandrinus*); since then the brown rat or wharf rat (*Mus norvegicus*) has overrun Raleigh, mainly or entirely replacing the former species.

The full data appear in the current number of

the *Journal of the Elisha Mitchell Scientific Society*.

No abstracts have been received for the following papers:

“Some Records of Incipient Fern Growth in Carboniferous Time,” Collier Cobb, University of North Carolina.

“The Seedling of the Water Oak,” W. C. Coker, University of North Carolina.

“Notes on Mutation,” W. N. Hutt, State Department of Agriculture.

“The Effect of Temperature on the Contact Resistance of Carbon on Copper,” P. H. Daggett, University of North Carolina.

“The Dispensary as a Factor in the Prevention and Cure of Hookworm Disease” (lantern), John W. Ferrell, State Board of Health.

“The Toxicity of Cotton Seed Meal,” W. A. Withers and B. J. Ray, with the cooperation of R. S. Curtis and G. A. Roberts, Agricultural and Mechanical College.

“The Walden Inversion,” Alvin S. Wheeler, University of North Carolina.

“The Work of the State Laboratory of Hygiene,” Director C. A. Shore, Raleigh.

“Some Reduction Phenomena in Hydroids,” H. V. Wilson, University of North Carolina.

“Some New Questions Concerning Ventilation,” C. W. Edwards, Trinity College.

“The Electrical Resistance of a Flowing Conductor,” A. H. Patterson and V. L. Chrisler, University of North Carolina.

“The Water Molds of Chapel Hill, N. C.,” W. C. Coker, University of North Carolina.

“Further Notes on the Geology of the Carolina Coast Line,” Collier Cobb, University of North Carolina.

“Transient Electrical Phenomena and their Relations to Modern Problems in Electrical Engineering,” P. H. Daggett, University of North Carolina.

“The Toxic Action of Hematin and Bile,” W. H. Brown, University of North Carolina.

“Notes on the Maturing of Bermuda Grass Seed,” O. I. Tillman, State Department of Agriculture.

“Studies of Cottonseed Meal Intoxication as to Pyrophosphoric Acid,” W. A. Withers and B. J. Ray, Agricultural and Mechanical College.

E. W. GUDGER,
Secretary

STATE NORMAL COLLEGE,
GREENSBORO, N. C.,
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